DATE A	REMARKS B	ORGANIZATION C
31 MAR 89	TCTO 1H-53-581 – WAS COMPLIED WITH TCTO 1H-53-774 – WAS COMPLIED WITH TCTO 1H-53-691 – WAS COMPLIED WITH TCTO 1H-53-672 – WAS COMPLIED WITH TCTO 1H-53-808 – WAS COMPLIED WITH TCTO 1H-53-670 – WAS COMPLIED WITH TCTO 1H-53-572 – WAS COMPLIED WITH	NADEP PNCLA , FL
01 MAY 89	REFURB C/W	1 SOW NADEP PNCLA, FL
26 APR 89	TCTO 1H-53-804 – REWIRING AUXILARY FUEL FLOW LIGHTS	NADEP PNCLA, FL
12 MAY 89	AIRCRAFT RECEIVED THIS STATION FOR ASSIGNMENT @ 5876.0 A/C HRS.	1550 CCTW KAFB, NM
19 MAY 89	C/W ANNUAL REVIEW OF ACFT HISTORICAL FORMS	1550 CCTW KAFB, NM
12 APR 90	ACE INSP PERFORMED AT KIRTLAND AFB, AT 6400.7 A/C HRS ON 12 APR 90 BY ACE TEAM MEMBER L.A. KHARFENSTINE NADEP PENSACOLA.	1550 CCTW KAFB, NM
05 MAR 91	ACE INSP PERFORMED AT KIRTLAND AFB, AT 6872.8 ACFT HRS ON 05 MAR 91 BY ACE TEAM MEMBER L.A. KHARFENSTINE NADEP PENSACOLA.	1550 CCTW KAFB, NM
10 DEC 91	ACFT DEPARTING THIS STATION FOR NADEP, PNCLA FL FOR SLEP MOD AT UNK A/C HRS.	542 CTW KAFB, NM
07 FEB 92	MH53J 69-05794 RECEIVED AT NADEP PENSACOLA FOR SLEP/MOD WITH 7461.2 A/C HRS.	NADEP PNCLA, FL
04 AUG 92	"ARC-186 ANTENNA RELOCATION IAW WR-ALC/LUP MEMO AND DRAFT TCTO"	NADEP PNCLA, FL
13 JUL 92	REPLACED TRANSITION SECTION, REMOVED FROM BUNO: 68-10360 (A/C TIME 7304.5) AND CONFIGURED PER SOW: 89 MMXSR-008-H53 PARA 3.2.2.6, A/C TIME, MH-53J 7461.2	NADEP PNCLA, FL
30 JUL 92	FITTING ASSY, PN: 9144932-10, S/TSN: P003, L/H UPPER TAIL PYLON ON FUSELAGE INSTALLED IAW 50K INSTALLATION AFT FUSELAGE MOD TCTO 1H-53-855	NADEP PNCLA, FL
07 OCT 92	OTI #L209021 EMERGENCY CONTROL PANEL. S/TSN: S-38	NADEP PNCLA
20 OCT 92	EXTENDED PITCH CONTROL ROD END 3 ½ TURNS IN R. H. ELECT COMPARTMENT TO ELIMINAT CYCLIC STICK INSTRUMENT PANEL INTERFERENCE. RIG PIN C CANNOT BE INSTALLED.	NADEP PNCLA

DATE A	REMARKS B	ORGANIZATION C
09 MAY 85	ONE TIME INSP MGB TAIL IDLER GEAR LOCKING BOLT. FOR SECURITY, C/W THIS DATE	41 CAMS MCCLELLAN CA
15 MAY 84	A/C 69-05794 HH53C ARRIVED AT NARF PNCLA FOR DMISA NAVAIR76 26BFTG WITH 4618.6 A/C HRS. ACI WR/H-53-84/1 WAS COMPLETED ON 15 MAY 85.	NARF PNCLA, FL
24 MAY 85	ACFT RECEIVED THIS STATION FROM NAVAIREWORKFAC PENSACOLA, FL. ACI @ 4601.4 A/C HRS ON THIS DATE.	41 CAMS MCCLELLAN CA
14 NOV 85	C/W CLASS 1B MOD REPOS OF KY-75 FOR CREW AS OF 28 AUG 85	41 CAMS MCCLELLAN CA
30 JAN 86	OTI ALL HH53B/C ACFT ENG CANNON PLUGS/CONN C/W THIS DATE.	41 CAMS MCCLELLAN CA
09 JAN 86	OTI PROPER ROUTING OF SERVO HYD LINES C/W THIS DATE.	41 CAMS MCCLELLAN CA
05 FEB 86	23AF MSG 042100Z FEB 86, AND QA LTR. DTD 05 FEB 86, OTI ROTATING SCISSORS UPPER LINK FOR SPECIFIC PN: C/W THIS DATE.	41 CAMS MCCLELLAN CA
09 MAY 86	OTI OF POLOT/COPILOT ESCAPE WINDOWS C/W THIS DATE. OTI RESCUE HOIST SUPPORT C/W THIS DATE.	41 CAMS MCCLELLAN CA
24 APR 86	OTI ON TAIL PYLON BRACES FOR CRACKS C/W THIS DATE	41 CAMS MCCLELLAN CA
06 FEB 86	OTI HH53B/C ACFT-ENG CANNON PLUGS/CONN C/W THIS DATE.	41 CAMS MCCLELLAN CA
18 JUN 86	OTI OF CABIN HYD LINES FOR CHAFFING AND WEAR C/W THIS DATE. CLASS 1B MOC INSTL AIRCREW WPNS SECURITY BOXES C/W THIS DATE.	41 CAMS MCCLELLAN CA
29 OCT 86	ACFT 69-05794 ARRIVED THIS STATION @ 5141.1 A/C HRS.	1 SOW HFLD, FL
11 AUG 88	ACFT DEPARTED THIS STATION FOR PENSACOLA FL @ 5847.5 A/C HRS.	1 SOW HFLD, FL
03 MAR 89	OMIT FLIGHT CONTROL RIG PIN "C" DUE TO LENGTHENING ROD 2 TURNS IN R/H "E" BAY, TO BRING CONTROL STICK OFF INSTRUMENT PANEL	NADEP PNCLA, FL
31 MAR 89	A/C MH-53J ARRIVED AT NADEP PNCLA ON 11 AUG 1988 FOR J MOD CONVERSION WITH 5848.8 A/C HRS. J MOD CONVERSION WR/H-53/89-3/1 WAS COMPLETED ON 31 MAR 89	NADEP PNCLA, FL

SIGNIFICANT HISTORICAL DATA

1. MISSION, DESIGN, SERIES, TYPE, MODEL AND SERIES	2. MANUFACTURER	3. SERIAL NUMBER	4. ACCEPTANCE DATA
INTERMEDIATE GEARBOX, 65357-07000-060	SIKORSKY	A18-235	UNKNOWN

DATE A	REMARKS B	ORGANIZATION C
14 FEB 1969	COMPLIED WITH TCTO 50-73 & 50-88	SIKORSKY
06 DEC 1973	INSTALLED ON A/C CH53A-151686 @ 640.0 A/C HRS. IGB TSN: 1487.0, TSO: 0.0	NARF PNCLA, FL
11 JAN 1985	REMOVED FROM A/C CH53A-151686 @ 2634.0 A/C HRS. IGB TSN: 3481.0, TSO: 1994.0 REASON" HI-TIME WAJ-294-806	NARF PNCLA, FL
20 FEB 1986	OVERHAULED: & NO LOAD TESTED IAW NA 03-95B-102 & TI 51-19 & 74-88 IGB TSN: 3481.0, TSO: 0.0	NARF PNCLA, FL
06 JUN 1988	INSTALLED ON A/C CH-53D-157143 @ 6411.0 A/C HRS. IGB TSN: 3481.0, TSO: 0.0	NARF PNCLA, FL
06 JUN 1988	COMPLIED ON SOAP IAW NAVMATINST 4731.1A. SOAP LAB LACATED AT KADENA AFB	NARF PNCLA, FL
23 AUG 1989	NOAP NORMAL AT KIMHAE AB, KOREA PRIOR TO TRANSFER	NARF PNCLA, FL
15 OCT 1991	PLACED ON NOAP W/ MONITORING LABS LOCATED AT NAS LEMOORE, CA	NARF PNCLA, FL
20 APR 1992	REWORKED FROM NOAP	NARF PNCLA, FL
03 APR 1993	NOAP OIL SAMPLES CHECKED GOOD AT NADEP PNCLA LAB	NARF PNCLA, FL
28 APR 1993	NOAP INITIATED AT MCGUIRE AFB, NJ IAW NAVMATINST 4731.1A	MCGUIRE AFB, NJ
17 JUL 1993	NOAP TERMINATED AT MCGUIRE AFB, NJ IAW NAVMATINST 4731.1A	MCGUIRE AFB, NJ
2004-10-20	REMOVED FROM A/C CH-53D-157143 @ 7616.3 A/C HRS. IGB TSN: 4686.3, TSO: 1205.3 REASON: UNKNOWN	NARF PNCLA, FL
2005-05-27	RECEIVED BY AIR FORCE, AFTO FORM 95 HISTORICAL ARCHIVE INITIATED PER T.O.1H-53(M) J-6. PREVIOUS HISTORY TRANSCRIBED THIS DATE.	WR-ALC/LUJC
2005-05-27	OVERHAULED: & NO LOAD TEST IAW NAVAIR 03-95B-102 & AFTI 2005-009 & -029 IGB TSN: 4686.3, TSO: 0.0	NADEP CP, NC
2005-06-05	INSTALLED ON A/C 69-05794 @ 11220.7 A/C HRS. IGB TSN: 4686.3, TSO: 0.0	16 HMXS HFLD, FL

TABLE 2. WRENCH TORQUE VALUES FOR STEEL, ALUMINUM ALLOY, AND TITANIUM ALLOY FASTENERS

	STEEL OR TITANIUM ALLOY FASTENERS IN TENSION (SEE NOTES 3,4)								AL ALLOY FASTENERS IN TENSION AND/ OR SHEAR		CASTELLATED NUTS (SEE NOTE 5) AND STEEL SHEAR NUTS			
	125,000 P.S.I.		160,000 P.S.I.		180,000 P.S.I.		220,000 P.S.I.				TENSION NUTS (SEE NOTE 4)		SHEAR	
	BOLT	NUT	BOLT	NUT	BOLT	NUT	BOLT	NUT	BOLT	NUT				
THREAD SIZE	AN3 THRU AN20 AN173 THRU AN186 MS20073	AN365 MS20365 MS21040 MS21043 MS21044 MS21045	MS20004 THRU MS20024 MS21008 NAS464 NAS1103 THRU1120 NAS1303 THRU1320 NAS6203 THRU6220	MS21042 NAS1291 SS5091 SS5096 SS5099 ESNA E5 SPS 42PW	NAS624 THRU 644	ESNA EB SPS-42PW SS5081 SS5086 SS5089 FBL10015	SPS-EWB22	SPS-EWM22 SS5080			AN310 AN121551 THRU AN121575 MS17825		AN320 AN364 AN150426 THRU AN150450 MS17826 MS20364 MS21083 MS21224 MS21244 SS5092 SS5095 (24)	
											MIN	MAX	MIN	MAX
10-32 .1900-32	50	45	55	50	60	55	65	60	23	18	20	45	12	20
1/4 .2500-28	110	100	125	110	135	120	150	135	48	43	50	100	30	50
5/16 .3125-24	185	165	190	180	225	200	260	230	93	83	100	165	60	100
3/8 .3750-24	325	275	375	320	405	345	460	395	165	138	165	275	80	165
7/16 .4375-20	550	450	640	520	690	560	770	640	275	225	270	450	100	270
1/2 .5000-20	770	670	890	780	960	840	1090	950	385	335	340	570	170	340
9/16 .5625-18	1100	1000	1280	1160	1380	1250	1600	1460	550	500	500	1000	250	500
5/8 .6250-18	1550	1350	1800	1570	1940	1690	2200	1930	775	675	680	1350	340	680
3/4 .7500-16	2700	2400	3130	2780	3380	3000	3830	3420	1350	1200	1200	2400	600	1200
7/8 .8750-14	4100	3700	4730	4270	5100	4600	5800	5250	2060	1850	1850	3700	925	1850
1 1.0000-12 1.0000-14	5900	5300	6850	6120	7400	6600	8450	7500	2950	2650	2650	5300	1325	2650
1-1/8 1.1250-12	8500	7500	9800	8700	10600	9400	12000	10750	4250	3760	2850	7500	1875	3750
1-1/4 1.250-12	12000	10000	13900	11900	15000	12500	17000	14300	6000	5000	5000	10000	2500	5010

NOTES:

1. UNLESS OTHERWISE SPECIFIED IN THE FD, VALUES SHOWN ARE IN INCH POUNDS AND APPLY TO LUBRICATED AND NON-LUBRICATED THREADS. TOLERANCE ON VALUES SPECIFIED IN TABLE 2 IS ±5%. WHEN PRACTICABLE, THE NUT, RATHER THAN THE BOLT, SHALL BE TORQUED.
2. TORQUE VALUES FOR NUTS WITH BAKED ON DRY FILM LUBRICANT SHALL BE AS SPECIFIED IN THE FD.
3. THE BOLT USED DETERMINES THE TORQUE REQUIREMENT FOR THE NUT. THEREFORE, ALTHOUGH A NUT MAY BE LISTED IN MORE THAN ONE COLUMN, IT SHALL BE TORQUED TO THE VALUE IN THE NUT COLUMN IMMEDIATELY TO THE RIGHT OF THE BOLT USED.
4. IF THE BOLT IS USED IN SHEAR AND A "TENSION" NUT IS USED, THE TORQUE REQUIREMENTS SHALL BE AS SPECIFIED IN TABLE 2, UNLESS OTHERWISE SPECIFIED IN THE FIELD OF DRAWING.
5. CASTELLATED NUT PROCEDURE:
   A. TIGHTEN NUT WITH TORQUE WRENCH TO MINIMUM VALUE SPECIFIED IN TABLE.
   B. IF SLOT IN NUT IS NOT ALIGNED WITH HOLE IN BOLT, CONTINUE TO TIGHTEN NUT UNTIL HOLE AND SLOT ARE ALIGNED.
   C. IF SLOT IN NUT IS ALIGNED WITH HOLE IN BOLT, CONTINUE TO TIGHTEN NUT SO THAT IT MOVES A MAXIMUM OF ONE CASTLE OR 60° OF ROTATION. TORQUE SHOULD NOT EXCEED THE MAXIMUM VALUES SPECIFIED IN TABLE FOR THE APPLICABLE THREAD SIZE.
6. TORQUE VALUES FOR AN924 JAM NUTS USED ON FLARED AND FLARELESS FITTINGS IN BULKHEAD INSTALLATION SHALL BE PER MS33586. UNLESS OTHERWISE SPECIFIED ON THE FD, ALL OTHER JAM NUTS SHALL BE TIGHTENED 1/6 TO 1/3 TURN BEYOND THE POINT WHERE A SHARP RISE IN TORQUE IS FELT.
7. CAUTION NOTED FOR TITANIUM AND PASSIVATED CRES: TO PREVENT HEATING AND GALLING OF TITANIUM AND PASSIVATED CRES PARTS OR BOLTS, COAT THE BOLT THREADS WITH LUBRICANT QUALIFIED TO MIL-L-23398 OR MIL-L-46010 AND APPLY REQUIRED TORQUE WITH A HAND TOOL AT A RATE THAT WILL NOT CREATE HEAT. DO NOT USE A TORQUING (DRIVING) MACHINE.
8. SELF-LOCKING TK (TEMP LOK) BOLTS MANUFACTURED TO ANY OF THE STANDARDS SPECIFIED IN THE TABLE ABOVE SHALL USE THE SAME TORQUE VALUES AS APPLIED TO THESE STANDARDS.
9. TORQUE VALUES WITHIN TORQUE SYMBOLS SHALL HAVE A TOLERANCE OF ± 5%, UNLESS OTHERWISE SPECIFIED.

DATE 7/1/44 REVISED (19) 9/18/91 (20) 8/11/92 (21) 10/16/92 (22) 4/6/94 (24) 7/27/01

2.1 GOVERNMENT SPECIFICATION AND STANDARDS

MIL-N-25027	Nut, Self-locking
MIL-C-22750	Coating, Epoxy, VOC-Compliant
MIL-C-23398	Lubricant, Solid Film, Air-Cured, Corrosion Inhibiting
MS33586	Fittings, Installation of Flareless Tube
MIL-L-46010	Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting
MIL-T-81772	Thinner, Aircraft Coating

3. REQUIREMENTS

3.1 ASSEMBLY TORQUE VALUES

Unless otherwise specified on the field of drawing, assembly torque values shall be as specified herein.

3.1.1 FIELD OF DRAWING (FD) CALLOUT

Special assembly torque requirements shall be indicated in the FD by a torque symbol consisting of a 0.62 dia. circle with diametrically opposed (top and bottom) arrowheads affixed by a leader to the nut end (preferred) or bolt to be tightened. The assembly torque shall be shown within the symbol. Unless otherwise specified, torque is in inch lbs. and the tolerance on the torque value shall be ±5%. (See Figure 1a.) If the torque is specified at the nut end, but the nut end is inaccessible, then the torque may be applied at the head end of the bolt. Unless otherwise specified, the torque at the head end of the bolt shall be 10% *higher* than the torque specified for the nut. When a torque range is specified on the engineering drawing, the bolt, screw, or nut shall be torqued to a nominal value that is halfway between the lower and upper limits of the range.

ex. If the specified torque for a nut is 100-160 IN LBS, then the nut shall be torqued to 130 IN LBS.

3.1.2 ABSENCE OF SPECIFIED ASSEMBLY TORQUE VALUES

Sometimes bolts, screws, or nuts do not have assembly torque values or procedures for applying torque specified on the engineering drawing. In these cases, the torque values in a column of Table 2 corresponding to the strength and size of the bolt, screw, or nut shall be used.

ex. NAS1204 has a tensile strength of 160,000 psi and a .2500-28 UNJF-3A thread. According to the bolt column of Table 2 corresponding to a tensile strength of 160,000 psi, the assembly torque for NAS1204 is 125 IN LBS.

If the assembly torque values are unspecified and the size of the fastener is less than #10 or the tensile strength of the fastener is less than 125,000 psi, then the threaded parts shall be tight. The word tight means that the bolt, screw, or nut shall be firmly secured and that there shall be no relative movement between the attached parts.

DATE 7/1/44 REVISED (19) 9/13/91 (20) 8/11/92 (21) 10/16/92 (22) 4/6/94

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SUBJECT: CH53E/T64-415 Stability Analysis (1977)

cc: GM Douglass
AJ Fleischmann
RE Gaerttner
PD Hoffman
MC Hollenbeck
RL Miller
JD Stewart
JA Wilson
Letterbook
DRB

AEG-Lynn
February 7, 1977

References:

1. EPN 64F643 (Proposed) - T64 MFC N_f Servo Redesign

2. CM No. (S/A) 5024 - CH53E Rotor/Drive-Train Simulation for N_f Servo Redesign - 12/1/76

3. CM No. (S/A) 5025 - Drive-Train Parameters During Autorotation - 12/21/76

4. CH53E/T64-415 Stability Analyses - 7/16/76 Through 10/13/76

   a. Initial Report
   b. Supplements I Through VI
   c. "Effects of Parameter Errors"
   d. "Preliminary Runs with Revised Simulation"

5. T58-5/RSRA Rotor Governing Stability Analysis - 6/15/76

Mr. W. M. Meyer, Manager
T58/T64 Turboshaft Programs
Building 34031

Summary

Revised simulations of the CH53E aircraft drive-train and rotor system were used to analyze system stability. The results are consistent with reported aircraft flight experience and with prior analyses. Use of a revised T64-415 engine P_3-sensing hose would provide some stabilization of the 2-Hertz oscillations. However, it would not provide a complete problem solution. A power turbine governor time constant change to approximately three times its current value would provide such a solution.

Control and engine portions of the system simulation are currently being reviewed. The results will be used to spot check the current analysis and refine the requirements for the governor. Flight testing will be required to evaluate the speed of response change resulting from increases of the governor time constant.

Conclusions

1. The revised CH53E aircraft load system simulation along with previously used simulations of the T64-415 engines provides a good analytical model for the study of stability trends at critical 2-Hertz mode flight conditions.

2. The system behavior predicted by this model is consistent with reported test experience including the effect of small system changes and repeatability of divergent 2-Hertz instability.

3. The predictions of the model are expected to be conservative at flight conditions other than those which are critical for the 2-Hertz problem. Substitution of appropriately larger values of lag damping and aerodynamics damping coefficients would remedy this defect.

4. Introduction of P_3-sensing lag by use of the revised P_3-sensing hose would help to limit the magnitude of 2-Hertz oscillations. It would not eliminate the oscillations; nor would it be effective at all conditions of system tolerances. It would provide a temporary expedient which permitted further flight testing at critical 2-Hertz conditions, not a permanent problem solution.

5. A three-times increase of the N_f-governor time constant would recover the desired minimum levels of stability margin providing that further reductions of effective main rotor blade lag damping do not occur.

6. The governor change will result in a reduction of the system speed of response for noncollective compensated power demand changes. The effect is not expected to significantly impact on aircraft handling qualities. However, flight evaluation would be required.

Recommendations

1. Continue with work effort now in process to refine the simulations of the engine and control system.

2. Use the resulting simulations to reanalyze 2-Hertz stability and refine the requirements for N_f governor changes.

3. Use the revised P_3-sensing hose only as a temporary expedient solution to the 2-Hertz problem to permit flight testing until a permanent solution becomes available.

Discussions

Further predictions of the linear stability margins were made. These calculations employed the updated CH53E helicopter drive-train and rotor simulations which were presented in references (2) and (3). The predictions considered the full range of coupled engine power as well as autorotational operation.

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Discussions (Continued)

The new load system simulation differs from that considered in the 1976 stability analyses in the following respects:

- o the main rotor system is defined by a lumped-parameter schematic rather than by a transfer function
- o main rotor parameter values have been revised from those implied by the transfer function
- o minor levels of main rotor and tail rotor aerodynamic damping have been added
- o drive-train and tail rotor parameter values have been revised.

The definition of the load system presented in reference (2) included values for two engine parameters which interact directly with the aircraft rotor system drive-train. Unfortunately, incorrect values were tabulated. PT, the power turbine rotor rotational movement of inertia, is 8.59 pound-feet-squared (3.204 inch-pound-seconds-squared). This is a revised value which differs from the value appearing in current engine documents. It was determined experimentally and corroborated by calculations. The correct value of PTS, the power turbine output shaft torsional spring constant, is estimated to be 83,000 inch-pounds per radian rather than 303,000 inch-pounds per radian as tabulated in reference (2). The 303,000 value may be calculated from data presented in paragraph 3.23 of the T64-415 engine model specification. It corresponds to the measuring section of the external torque shaft but does not include the entire external torque shaft nor that section of the power turbine shaft which is contained within the engine. Experimental verification of the PTS value has been planned. The larger reference (2) value had been used in prior stability analyses. Stability analysis runs were made to define the impact of this error on the system stability margins. The calculation results indicated that the effect was negligible.

The main rotor lag damping coefficient provided in reference (2) was selected to "correspond to the critical high speed, high power condition" but was applied at all levels of engine power. Consequently, calculated levels of main and tail rotor resonance gain margin will be conservative at levels of engine power which do not correspond to the critical flight condition. Higher values may also be expected at other conditions of operation (e.g., hover or low speed flight) where the total levels of main rotor blade lag activity are more compatible with the capabilities of the lag dampers.

It was assumed that main rotor aerodynamic damping would vary linearly with total engine power through the two values provided in reference (2). In accordance with reference (2) instructions, lag damping was decreased by the amount of aerodynamic damping applied at each power level. It was noted that the level of aerodynamic damping defined by reference (2) is 15% of that which would be calculated based on the assumption that rotor torque demand varied as the square of rotor speed. The minimum expected level based on prior stability

Discussions (Continued)

analysis experience is 40%. The defined aerodynamic damping values apparently also correspond to the critical flight condition and could be expected to be greater at other power levels or other conditions of flight.

A series of stability margin calculations were made for each of four configurations of the engine control system:

- Series A - Standard Control System
- Series B - Revised P_3-Sensing Hose
- Series C - 4-Times N_f Governor Time Constant
- Series D - 3-Times N_f Governor Time Constant

Stability margin results over the power range are tabulated in Tables I, II, III and IV. All of the calculations are based on operation at 100% power-turbine speed and three engines at equal power levels.

Table I indicates that the lowest levels of stability margin at the main rotor resonance mode occur over the upper half of the available engine power range with the minimum margin occurring at normal rated power. The calculated level at NRP is very small but positive indicating that the system would be stable but subject to prolonged periods of slowly converging oscillations at rotor resonance frequency, if suitably disturbed. However, the margin is small enough so that normal system tolerance effects could frequently result in a negative stability margin and an unstable divergent pattern of oscillation. This indication of the analysis is entirely consistent with the reported flight testing results. The resonant frequency predicted by the analysis is approximately ½ Hertz higher than the nominal value reported from flight testing.

Stability margins at the tail rotor resonance mode decrease with increasing system power level and drop below the desired minimum level above normal rated power.

The system phase margin is excellent across the entire range of coupled power. It is lower for autorotational operation but still exceeds desired minimum levels. There does not appear to be a significant difference in autorotational stability between the outboard engines and the aft engine.

The calculation results at NRP (Case A03) in Table I are very close to results obtained for the prior aircraft simulation as reported for Case 403 in reference (4)-c. The small differences are attributed to differences in the aircraft simulations.

Table II indicates the effects of adding P_3-lag by using the revised P_3-sensing hose. The nature of the P_3-lag effect was discussed in reference (4)-b (Supplement III). The resulting effective P_3-sensing time constant is sensitive

Discussions (Continued)

to the level and rate of change of the P_3 signal. At the time constant breakpoint frequency it varies directly with the square root of oscillation amplitude and inversely with the square root of nominal P_3 level. This means that low effective time constant levels will be experienced during slow transient or at steady-state conditions for which low amplitudes of oscillation are present. The effective time constant will increase for rapid transients or increased magnitudes or frequencies of oscillation. Thus, the revised P_3-sensing hose will tend to limit rather than eliminate oscillations at the 2-Hertz mode. The time constant level analyzed in the calculations of Series B corresponds to a P_3 amplitude of $\pm$ 1.5% of steady-state P_3 and the steady-state P_3 level which corresponds to each power level.

Tables III and IV indicate the effects of 4-times and 3-times increases of the N_f governor time constant. An increase factor of three is sufficient to provide the desired minimum level of gain margin at main rotor resonance. It also provides excellent levels of gain margin at tail rotor resonance. Note, though, that the phase margins and frequencies at gain cross-over have decreased significantly from those occurring for the standard control system.

The resulting phase margins are still quite adequate. The decrease indicates that the low frequency component of settling-out oscillations will be somewhat less damped than for a standard system.

Gain cross-over frequency is a rough index of the system speed of response for applied disturbances. High cross-over frequencies correspond to high speeds of response. The increased governor time constant will reduce the speed of response of the system. This effect will apply only for power demand changes that are not accompanied by corresponding changes of collective compensation signal to the fuel control Beta shaft. It may be noted that the gain cross-over frequencies of Table IV are approximately equal to those presented in reference (5) for T58-5 powered RSRA aircraft.

Tables II, III and IV indicate that autorotational stability is insensitive to P_3 sensing or N_f governor changes. The governor changes would result in lower speeds of response but this effect has little significance when the power turbines are de-coupled from the drive train.

Main fuel control block diagram definition testing is now in process at Hamilton Standard. The results of this testing could alter the transfer functions now used to simulate the dynamic behavior of the several control paths. Current simulations indicate that the principal dynamic effects occur at frequencies above those which are significant for engine/airframe interactions for all but the N_f error servo. That servo has dynamics at lower frequencies consistent with its specified time constant. Test results are not expected to materially change the control simulation. Some minor refinement of low frequency dynamics and the addition of less-significant high frequency dynamics is expected.

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Discussions (Continued)

Test data from recent transient testing of a T64-415 engine are also now being analyzed and applied to refinement of a transient simulation model of the engine system. These data will also be reviewed and applied to refinement of the linear engine simulation that is used for stability analyses.

Further stability analysis calculations will be made to evaluate the effects of control and engine simulation refinements as those refinements are defined.

E. W. Coldewey

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/p

CH53E / T64-415 LINEAR N_F-GOVERNING STABILITY ANALYSIS

TABLE I - BENCH-MARK CONDITIONS

- 3 ENGINES OPERATING @ N_F = 100%
- STANDARD CONTROL SYSTEM

CASE NO.	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13
SHP/ENGINE	4645	4150	3646	3100	2600	2100	1600	1100	700	350	0 (COUPLED)	0 AUTOROT.	0 AUTOROT.
TOTAL SHP	13940	12450	10940	9300	7800	6300	4800	3300	2100	1050	0	ENG 2	ENG 1,3
GAIN CROSS-OVER													
FREQ, RAD/SEC.	3.19	3.22	3.18	3.12	3.03	2.87	2.66	2.44	2.19	1.78	.905	5.87	5.94
PHASE MARGIN, DEG.	+68	+65	+64	+63	+63	+64	+64	+64	+63	+68	+93	+42	+41
1ST PHASE CROSS-OVER													
FREQ, RAD/SEC.	16.28	15.79	15.37	15.10	14.96	14.90	14.82	14.22	14.66	14.68	14.93	—	—
GAIN MARGIN, DB.	+.85	+.32	+.10	+.20	+.78	+1.69	+2.98	+4.8	+7.1	+10.0	+14.4	—	—
2ND PHASE CROSS-OVER													
FREQ, RAD/SEC.	37.68	37.65	37.62	37.60	37.59	37.59	37.59	37.59	37.60	37.60	37.61	—	—
GAIN MARGIN, DB.	+3.9	+4.8	+6.0	+6.9	+7.9	+8.9	+10.3	+12.3	+14.5	+17.3	+21.2	---	—

EWC 1-26-77

CH53E / T64-415 LINEAR NF - GOVERNING STABILITY ANALYSIS

TABLE II - REVISED P_3 - SENSING HOSE

CASE No.	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13
SHP/ENGINE	4645	4150	3646	3100	2600	2100	1600	1100	700	350	0 (COUPLED)	0 AUTOROT ENG 2	0 AUTOROT ENG 1,3
TOTAL SHP	13940	12450	10940	9300	7800	6300	4800	3300	2100	1050	0		
GAIN CROSS-OVER													
FREQ, RAD/SEC.	3.15	3.16	3.12	3.06	2.96	2.79	2.59	2.37	2.14	1.72	.900	5.38	5.42
PHASE MARGIN, DEG.	+63	+61	+60	+59	+59	+60	+60	+60	+60	+65	+91	+43	+43
1ST PHASE CROSS-OVER													
FREQ, RAD/SEC	16.42	16.00	15.61	15.37	15.24	15.19	15.12	15.02	14.95	14.97	15.21	—	—
GAIN MARGIN, DB.	+3.33	+2.90	+2.72	+2.82	+3.41	+4.3	+5.6	+7.2	+9.4	+12.2	+16.5	—	—
2ND PHASE CROSS-OVER													
FREQ, RAD/SEC	37.84	37.77	37.73	37.71	37.70	37.70	37.69	37.69	37.69	37.69	37.69	—	—
GAIN MARGIN, DB.	+5.4	+6.0	+6.9	+7.8	+8.7	+9.8	+11.1	+13.0	+15.2	+17.9	+21.9	—	—

EWC 1-26-77

U-9.8

11/09/2007 07:25AM

2-14-77

CH53E/T64-415 LINEAR NF-GOVERNING STABILITY ANALYSIS

TABLE III 4x NF GOVERNOR TIME CONSTANT

CASE NO.	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13
SHP/ENGINE	4645	4150	3646	3100	2600	2100	1600	1100	700	350	0 (COUPLED)	0 AUTO ROT	0 AUTO ROT
TOTAL SHP	13940	12450	10940	9300	7800	6300	4800	3300	2100	1050	0	ENG 2	ENG 1,3
GAIN CROSS-OVER													
FREQ, RAD/SEC	2.30	2.32	2.29	2.27	2.20	2.10	1.98	1.84	1.69	1.42	.806	3.17	3.17
PHASE MARGIN, DEG.	+42	+40	+39	+38	+38	+39	+40	+40	+40.	+46	+75	+44	+44
1ST PHASE CROSS-OVER													
FREQ, RAD/SEC	14.68	14.36	14.09	13.91	13.81	13.77	13.72	13.64	13.58	13.59	13.78	—	—
GAIN MARGIN, DB	+8.3	+8.0	+7.9	+8.0	+8.6	+9.6	+11.0	+12.8	+15.1	+18.1	+22.3	—	—
2ND PHASE CROSS OVER													
FREQ, RAD/SEC	37.59	37.55	37.52	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.51	—	—
GAIN MARGIN, DB	+15.6	+16.5	+17.6	+18.7	+19.7	+20.7	+22.1	+24.0	+26.1	+28.9	+33.0	—	—

EWC 1-26-77

P10 2-14-77

U-9.9

13

CH53E / T64-415 LINEAR NF-GOVERNING STABILITY ANALYSIS

TABLE IV 3X NF GOVERNOR TIME CONSTANT

CASE NO.	D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12	D13
SHP/ENGINE	4645	4150	3646	3100	2600	2100	1600	1100	700	350	0 (COUPLED)	0 AUTOROT	0 AUTOROT
TOTAL SHP	13940	12450	10940	9300	7800	6300	4800	3300	2100	1050	0	ENG. 2	ENG. 1,3
GAIN CROSS OVER													
FREQ, RAD/SEC	2.52	2.55	2.55	2.50	2.42	2.30	2.17	2.02	1.82	1.49	.843	3.68	3.70
PHASE MARGIN, DEG	+46	+44	+42	+42	+42	+43	+44	+44	+44	+51	+80	+42	+42
1ST PHASE CROSS-OVER													
FREQ, RAD/SEC	14.84	14.50	14.21	14.02	13.92	13.88	13.82	13.74	13.69	13.70	14.74	—	—
GAIN MARGIN, DB	+6.3	+5.9	+5.7	+6.0	+6.6	+7.5	+8.9	+10.7	+13.1	+16.0	+20.2	—	—
2ND PHASE CROSS-OVER													
FREQ, RAD/SEC	37.60	37.57	37.53	37.51	37.51	37.51	37.51	37.51	37.51	37.52	37.52	—	—
GAIN MARGIN, DB	+13.1	+14.0	+15.1	+16.2	+17.2	+18.2	+19.6	+21.5	+23.8	+26.5	+30.5	—	—

EWC 1-26-77

U-9.10

2-14-77 p11 13

Sikorsky Aircraft Corporation
6900 Main Street, P.O. Box 9729
Stratford, Connecticut 06497-9129
(203) 386-4000

Sikorsky
A United Technologies Company

SEL-9369
07-AF-FA8509-0043

November 15, 2007

AFSOC A/8PP
Attn: Maj. Mike Stohler
100 Bartley Street
Suite 243 West
Hurlburt Field, FL 32544

Attention: Maj. Mike Stohler

Subject: Sikorsky Drawing Submittal in response to the USAF MH-53M Mishap Investigation

Reference: (a) Contract FA8509-05-C-0001, DD Form 1423-1, Contract Data Requirements List Item A004, Technical Report – Study / Services

Enclosure (1): CD-ROM containing the following drawing 65350-07101.

The Contractor hereby submits Enclosure (1) in accordance with the requirements of Reference (a).

Sikorsky provides drawing 65350-07101 Revision M, FD Sheets 1 and 2, Revision K, FD Sheet 2 and 3, EO 41242 against Drawing 65350-07101 Revision B, FD Sheets 2 and 3, Revision A, FD Sheets 2 and 3.

All questions regarding this enclosure may be addressed to the undersigned at (203) 386-5382.

Very truly yours,
SIKORSKY AIRCRAFT CORPORATION

Michael A. Gugliotti

Michael A. Gugliotti
Engineering Team Lead, Aftermarket Engineering Platform

Cc: Mr. Jim Sawinski, MH-53 Aero Engineer
Mr. Ray Goorah, MH-53J/M Project Engineer
Mr. Dan Smith, MH-53J/M Engineering

DECLARATION OF TECHNICAL DATA CONFORMITY

The contractor, Sikorsky Aircraft, hereby declares that, to the best of its knowledge and belief, the technical data delivered herewith under Contract FA8509-05-C-0001 is complete, accurate and complies with all requirements of the contract.

Date: 11/15/2007

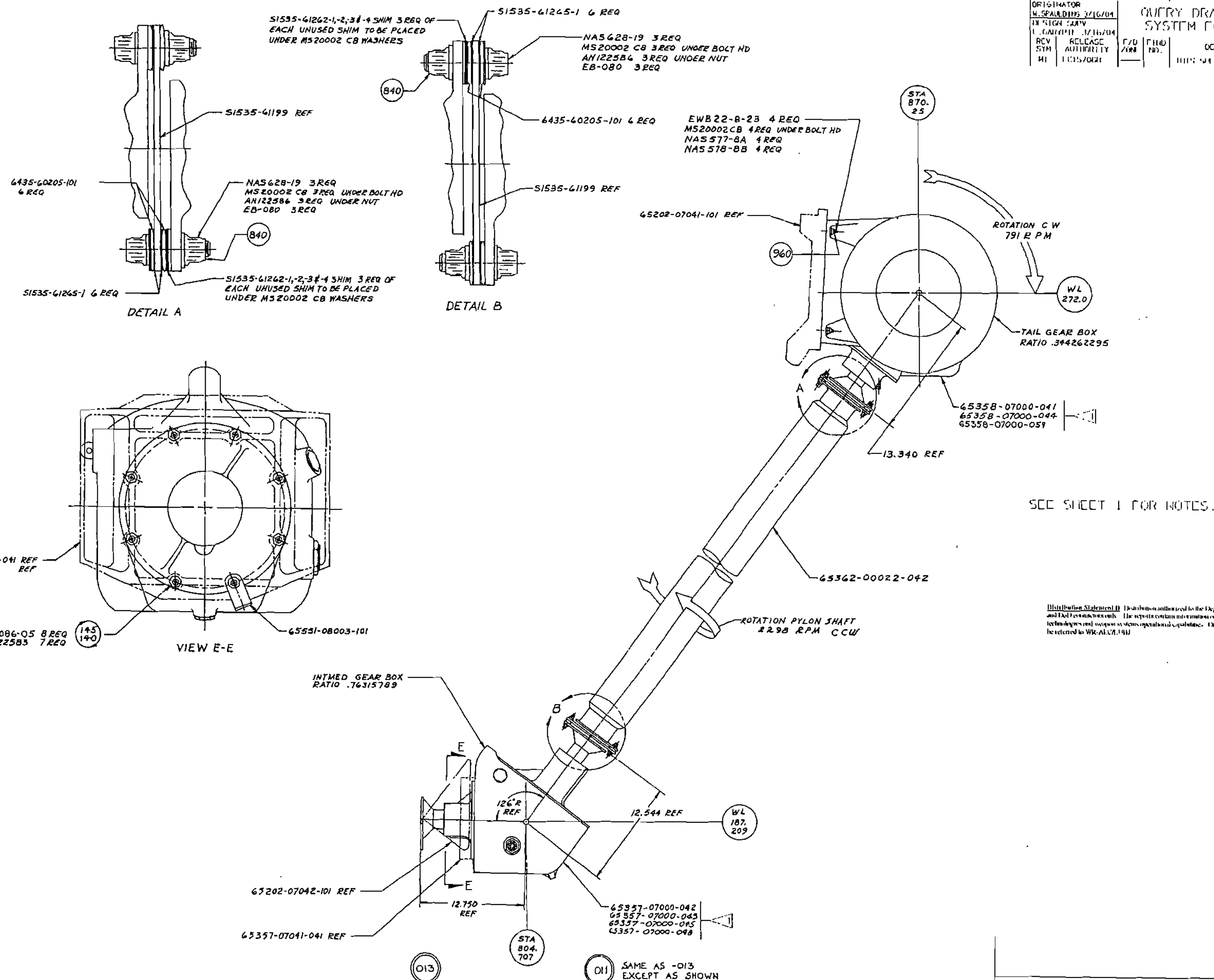
Name and Title of Authorized Official:

Michael A. Gugliotti

Michael A. Gugliotti
Engineering Team Lead,
Aftermarket Engineering Platform

ORIGINATOR				
M. SPAULDING 3/16/04				
DESIGN SUPV				
L. GANGPH 3/16/04				
RCV SYM	RELEASE AUTHORITY	F/D ZONE	FIND NO.	DESCRIPTION OF CHANGE
M1	EC05/008	—		THIS SHEET ADDED

QUERY DRAWING RELEASE SYSTEM FOR APPROVALS



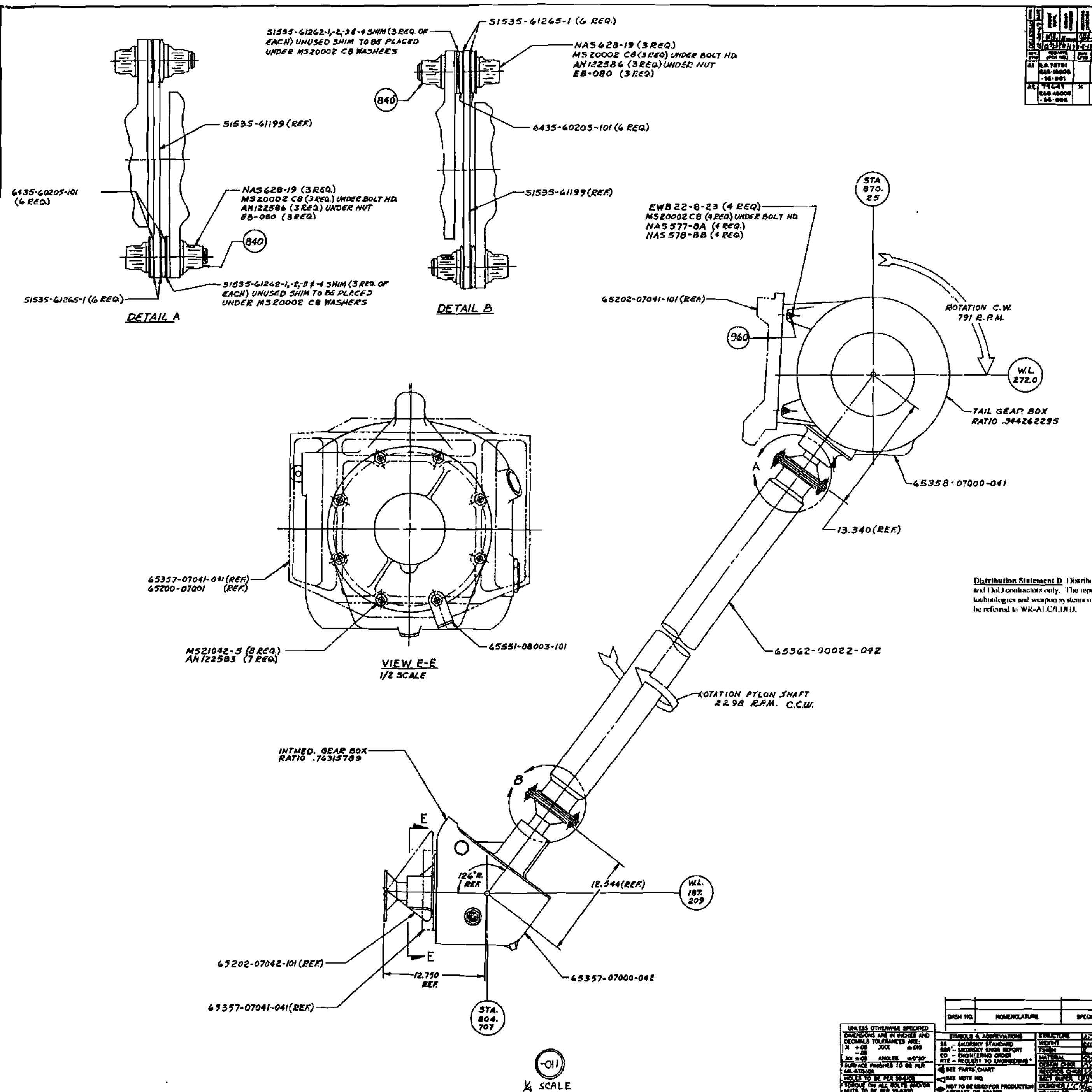
SEE SHEET 1 FOR NOTES.

Distribution Statement D: Distribution authorized to the Department of Defense and DoD contractors only. The reports contain information on critical technologies and weapon systems operational capabilities. Other requests shall be referred to WR-ALC/LUJD

SEE SEPARATE PARTS LIST

NO CHANGE MAY BE MADE TO THIS DRAWING SHEET EXCEPT BY INPUT TO CAD FILE

MFG CONTRACT NO N00019-67-C-0401		Sikorsky
QUERY DRAWING RELEASE SYSTEM FOR APPROVALS	RELEASE AUTHORITY E1654-00-7	DRAWING TITLE: TRANSMISSION INSTALLATION PYLON
	DRAWN BY RASKA L. 10 66	
	DESIGNER P.C. MARINACCIO 7 15 66	SIZE C · CAGE NO 78286 · DRAWING NUMBER 65350-07101 · REV M
	DESIGN SUPV A. J. S. 07 15 66	SCALE NONE · SHEET 2



Distribution Statement D Distribution authorized to the Department of Defense and DoD contractors only. The reports contain information on critical technologies and weapon systems operational capabilities. Other requests shall be referred to WR-ALC/LUHB.

Sikorsky Aircraft
STRATFORD, CONN.

TRANSMISSION INSTALLATION PYLON

CODE IDENT NO.	SIZE	
78286	E	65350-07101

SCALE 1:1 & NOTED — SHEET 3

PARTS CHART					
ITEM NO.	PART NO.	USED ON MODEL	EFFECTIVITY FROM	EFFECTIVITY THRU	REPLACED BY PART NO.

CHKD	DATE	DESIGN SUPR.	DESIGN CHECKER	RECORDS CHECKER	MATERIALS	FINISH	STRESS	WEIGHTS	PROJECT ENGINEER	ENGRG. REP.	P.C.C.	CLASS
LANTZ	8-12-68	WJB	X	GR	X	—						

DWG. NO. 65350-07101 SHEET 2
C.N. C.C.N. GOVT. APPROVAL HYRO/[illegible] 11-25-68

REV. SYM	SEO/RTE (PCN NO.)	SWN LFTD	F/O ZONE	LM	PL COL.	EFFECTIVITY	DESCRIPTION OF CHANGE
B	EO-34419 PG5-55043-07-001. PG6-56010 35-001				Y	GT-19993 & SUBS S/T GG-14435 & SUBS	CREATED: -013 ASSY. SAME AS -011 ASSY EXCEPT ADDED: 65357-07000-043 INTERMEDIATE GEAR BOX. 1 REQ. REMOVED: 65357-07000-042 INTERMEDIATE GEAR BOX. 1 REQ.

Distribution Statement D. Distribution authorized to the Department of Defense and DoD contractors only. The reports contain information on critical technologies and weapon systems operational capabilities. Other requests shall be referred to WR-ALC/LUHJ.

TO BE CHECKED FOR ACTIVE E.O.'s or R.T.E.'s	DATE

NOTES

1. P/F ELASTIC STOP NUT CORP.
2. P/F STANDARD PRESSED STEEL CO.

QTY	QTY	QTY	◆	▶	◁	◀	CODE IDENT NO.	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
-013		-011									
6		6			1		72962	EB-080	NUT	.035	
4		4			2		56878	EWB22-8-23	BOLT	.16	
10		10						MS 20002C8	WASHER	.007	
8		8						MS 21042-5	NUT	.006	
6		6						NAS628-19	BOLT	.148	
4		4						NAS 578-8B	RETAINER	.019	
4		4						NAS 577-8A	BARREL NUT	.006	
6		6						AN122586	WASHER	.006	
7		7						AN122583	WASHER	.003	
12		12						6435-60205-101	WASHER	.03	
12		12						S1535-61265-1	WASHER	.04	
6		6						S1535-61262-4	SHIM	.03	
6		6						S1535-61262-3	SHIM	.01	
6		6						S1535-61262-2	SHIM	.01	
6		6						S1535-61262-1	SHIM	.01	
1		1						65551-08003-101	BRACKET	.012	
1		1						65362-00022-042	PYLON SHAFT ASS'Y	19.27	
1		1						65358-07000-041	TAIL GEAR BOX	155.58	
1		—						65357-07000-043	INTERMEDIATE GEAR BOX		
—		1						65357-07000-042	INTMED. GEAR BOX	71.15	
								65350-07101-012	TRANS INSTL PYLON	249.23	
								65350-07101-011	TRANS. INSTL PYLON	249.23	

(B) DASH NO. — PARTS LIST

SYMBOLS & ABBREVIATIONS
SS – SIKORSKY STANDARD
SER – SIKORSKY ENGRG REPORT
EO – ENGINEERING ORDER
RTE – REQUEST TO ENGINEERING
◀ SEE PARTS CHART
◁ SEE NOTE NO.
◆ NOT TO BE USED FOR PRODUCTION AIRCRAFT OR SPARES
▶ VENDOR ITEM – SEE SOURCE CONTROL OR SPECIFICATION CONTROL DRAWING

WEIGHT	DELESSIO	7-1-66
RECORDS CHKR	[illegible]	7-24-66
SECT SUPER.	[illegible]	7-25-66
DESIGNER	[illegible]	7-13-66
DRAWN BY	DELESSIO	7-1-66
REL GROUP	[illegible]	7-28-66

RELEASED BY ET 6511-00-1 DATE 8-4-66 PROJ OFF 9511
GOVT APP BY
DATE

Sikorsky Aircraft DIVISION OF UNITED AIRCRAFT CORPORATION
STRATFORD, CONN.

TRANSMISSION INSTL PYLON

CODE IDENT NO. 78286 SIZE C 65350-07101
SCALE NONE ORIGINALLY PREPARED UNDER CONTRACT NO. NOw 19-[illegible] SHEET 2 OF

SYM B DWG NO 65350-07101

S4-5083 REV A

	PARTS CHART					
	ITEM NO.	PART NO.	USED ON MODEL	EFFECTIVITY FROM	EFFECTIVITY THRU	REPLACED BY PART NO.
	1	65358-07000-041	HH53C	67-14993	68-8286	65358-07000-044
	1	65358-07000-044	HH53C	68-10354	73-1652	NONE
	2	65357-07000-043	HH53C	67-14993	68-8286	65357-07000-045
	2	65357-07000-045	HH53C	68-10354	69-5797	65357-07000-098
	2	65357-07000-098	HH53C	SUBQ TO 69-5797	& SUBQ	NONE
	3	65358-07000-044	HH53C	68-10354	73-1652	65358-07000-059
(K3)	3	65358-07000-059	HH53C	SUBQ TO	73-1652	NONE
	3	65358-07000-044	HH53B	66-14428	66-14435	65358-07000-059
	3	65358-07000-059	HH53B	SUBQ TO	66-14435	NONE

ORIG	DATE	DESIGN SUPV	DESIGN CHECKER	STRUCT ANAL	STRUCT SUPV	MATERIAL	FINISH	MASS PROP	RELB/MAINT	SYS ENGR	TEST		TASK MANAGER	CLASS	CMO	RELEASE GROUP	CONTRACT MOD NO.
[signature]	2-27-84	[signature] 3/28/84	WJB 4/1/84	[signature] 2-27-84	[signature] 3/28/84			[signature]		3/28/84			W Wu 3/29/84	1	[signature]	[signature]	

REV SYM	RELEASE AUTHORITY	F/D ZONE	FIND NO	DESCRIPTION OF CHANGE
K1	EO 41242			INCORPORATED EO 41242
K2				ADDED 65358-07000-059 TO -013 TRANS INSTL PYLON
K3				PARTS CHARTED 65358-07000-059
K4	ECN 7509A35-006			ADDED 65350-07101-013 TO THE -013 TRANS INSTL PYLON WJB

NOTES

1. P/F ELASTIC STOP NUT CORP
2. P/F STANDARD PRESSED STEEL CO.

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QTY -013	QTY	QTY -011	◆	▶	◁	◀	CODE IDENT NO.	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
6		6			1		72962	EB-080	NUT	.035	
4		4			2		56878	EWB 22-8-23	BOLT	16	
10		10						MS 20002C8	WASHER	.007	
8		8						S55086-05	NUT	.006	
6		6						NAS 628-19	BOLT	.148	
4		4						NAS 578-8B	RETAINER	.019	
4		4						NAS 577-8A	BARREL NUT	.006	
6		6						AN122586	WASHER	.006	
7		7						AN122583	WASHER	.003	
12		12						6435-60205-101	WASHER	.03	

013 | -011 ← DASH NO. — PARTS LIST

REV	QTY -013	QTY	QTY -011	◆	▶	◁	◀	CODE IDENT NO	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
	12		12						51535-61265-1	WASHER	.04	
	6		6						51535-61262-4	SHIM	.03	
	6		6						51535-61262-3	SHIM	.01	
	6		6						51535-61262-2	SHIM	.01	
	6		6						51535-61262-1	SHIM	.01	
	1		1						65551-08003-101	BRACKET	012	
	1						2		65357-07000-098	INTERMEDIATE GEAR BOX	76.66	
	1											
	1		1						65362-00022-042	PYLON SHAFT ASS'Y	19.27	
(K2)	1						3		65358-07000-059	TAIL GEARBOX		
	1						1,3		65358-07000-044	TAIL GEAR BOX		
	1		1				1		65358-07000-041	TAIL GEAR BOX	155.58	
	1						2		65357-07000-045	INTERMEDIATE GEAR BOX		
	1						2		65357-07000-043	INTERMEDIATE GEAR BOX		
(K1)												
	—		1						65357-07000-042	INTMED. GEAR BOX	71.15	
(K4)	---								65350-07101-013	TRANS INSTL PYLON	250.23	
									65350-07101-012	TRANS INSTL PYLON	249.23	
									65350-07101-011	TRANS INSTL PYLON	249.23	

(B) -013 | -011 ← DASH NO — PARTS LIST

SYM K — DWG NO 65350-07101

SYMBOLS & ABBREVIATIONS
- SS – SIKORSKY STANDARD
- SER – SIKORSKY ENGRG REPORT
- EO – ENGINEERING ORDER
- RTE – REQUEST TO ENGINEERING
- ◀ SEE PARTS CHART
- ◁ SEE NOTE NO
- ◆ NOT TO BE USED FOR PRODUCTION AIRCRAFT OR SPARES
- ▶ VENDOR ITEM – SEE SOURCE CONTROL OR SPECIFICATION CONTROL DRAWING

WEIGHT	DELESSIO	7-1-66
RECORDS CHKR	[signature]	7/24/66
SECT SUPER	[signature]	7-25-66
DESIGNER	P.C. MacCall	7-7-66
DRAWN BY	DELESSIO	7-1-66
REL GROUP	[signature]	9-29-66

RELEASED BY E.I. 654-00-7
DATE 8-23-66 PROJ OFF [signature]
GOVT APP BY
DATE

Sikorsky Aircraft DIVISION OF UNITED AIRCRAFT CORPORATION
STRATFORD, CONN

TRANSMISSION INSTL PYLON

CODE IDENT NO	SIZE	
78286	C	65350-07101

SCALE NONE | ORIGINALLY PREPARED UNDER CONTRACT NO N00019-67C-0401 | SHEET 2 OF

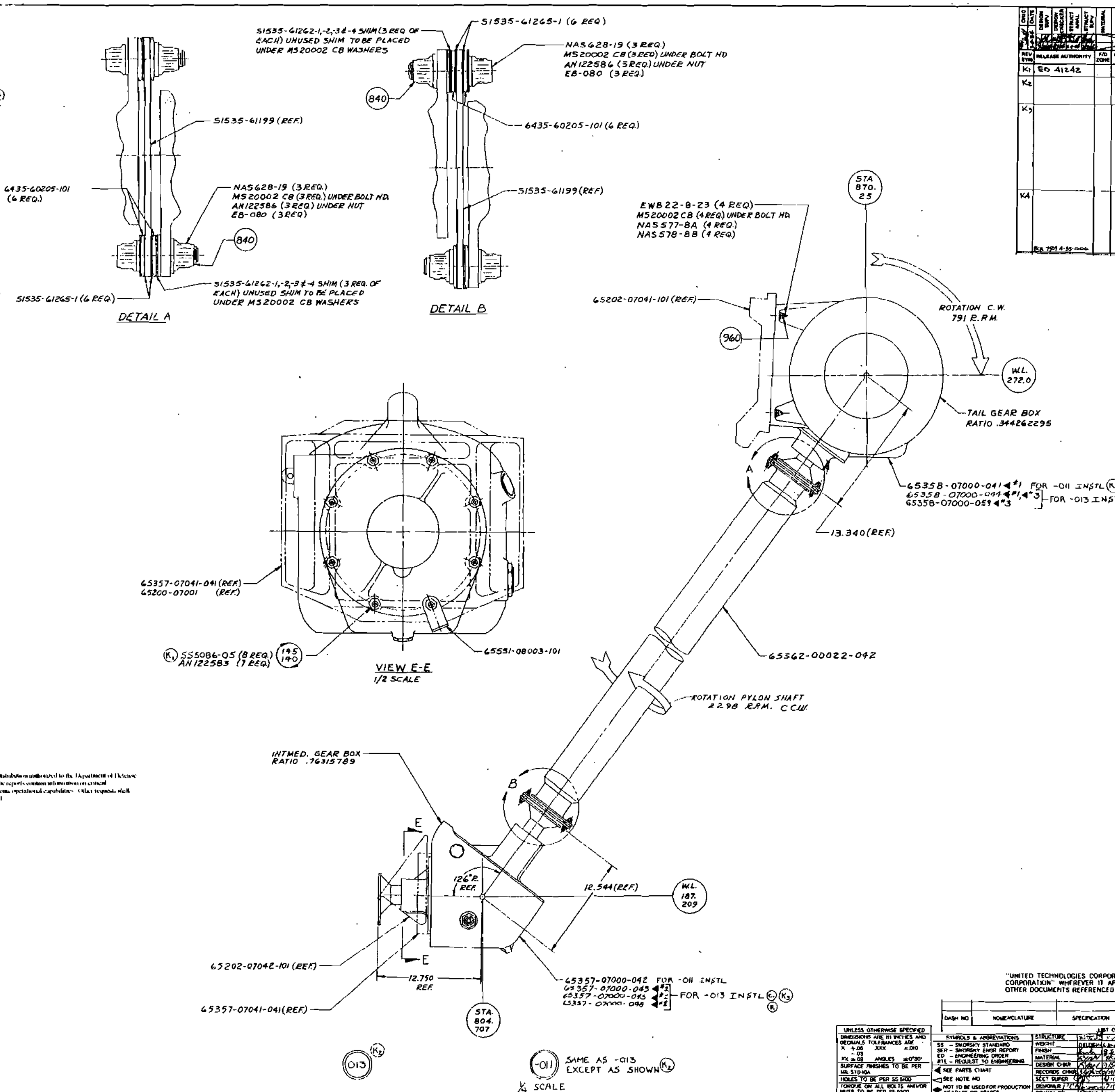
LOCATION | DATE 12/20/84 | LOG LG | VEL | TOZ | AMT 28

SA-5083 REV. A

U-10.8

APPLICATION OF PROTECTIVE FINISHES				
TYPE	DASH NOS. APPLICABLE			
FN #1				
FN #2	-011 -012 -013 (B)			
FN #3				
SPEC	TREATMENT	FN #1	FN #2	FN #3
MIL-A-8625	ANODIZE			
MIL-P-8585	PRIMER			
MIL-C-5541	CHEM. SURFACE TREAT			
QQ-P-416	CADMIUM PLATE			
SS-8630	INSULATE DISSIMILAR METALS ON ASSY/INSTL		✓	
	TOUCH UP FIN ASSY/INSTL		✓	

INSPECTION REQUIREMENTS								
DASH NO	MAGNETIC MIL-I-6868				FLUORESCENT MIL-I-6866			
	ROUGH PART		FIN. PART		ROUGH PART		FIN PART	
	YES	NO	YES	NO	YES	NO	YES	NO
011		✓		✓		✓		✓
013 (B)		✓		✓		✓		✓



Distribution Statement D: Distribution authorized to the Department of Defense and DoD contractors only. The reports contain information on critical technologies and weapon systems operational capabilities. Other requests shall be referred to WR-ALC/LUH.

REV SYM	RELEASE AUTHORITY	F/D ZONE	FIND NO.	DESCRIPTION OF CHANGE
K1	EO 41242			INCORPORATED EO 41242
K2				ADDED -013 & -011 SAME AS -012 (SAME) EXCEPT AS SHOWN (ADDED)
K3				(NOW) 65357-07000-042 FOR -011 INSTL; 65357-07000-043 ◀#2, 65357-07000-045 ◀#2, 65357-07000-048 ◀#2 FOR -013 INSTL; (WAS) 65357-07000-042, 65357-07000-043 ◀#2, 65357-07000-045 ◀#2, 65357-07000-048 ◀#2
K4	ECR 7914-85-006			(NOW) 65358-07000-041 ◀#1 FOR -011 INSTL; 65358-07000-044 ◀#1 ◁#3, 65358-07000-059 ◀#3 FOR -013 INSTL; (WAS) 65358-07000-041 ◀#1, 65358-07000-044 ◀#1

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DASH NO	NOMENCLATURE	SPECIFICATION	MATERIAL OR NOTE	UNIT WT	ZONE

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES AND DECIMALS TOLERANCES ARE
X +.06 -.03 XXX ±.010
XX ±.03 ANGLES ±0°30'
SURFACE FINISHES TO BE PER MIL-STD-10A
HOLES TO BE PER SS 5400
TORQUE ON ALL BOLTS AND/OR NUTS TO BE PER SS-9300
GEOMETRIC TOLERANCES TO BE PER SS-9210
BREAK ALL SHARP EDGES .005-.015R
PART MARKING PER SS-9797.

SYMBOLS & ABBREVIATIONS
SS - SIKORSKY STANDARD
SER - SIKORSKY ENGR REPORT
EO - ENGINEERING ORDER
RTE - REQUEST TO ENGINEERING
◀ SEE PARTS CHART
◁ SEE NOTE NO
◆ NOT TO BE USED FOR PRODUCTION AIRCRAFT OR SPARES
▶ VENDOR ITEM - SEE SOURCE CONTROL OR SPECIFICATION CONTROL DRAWING
RELEASED BY
DATE ... FRAN OFF

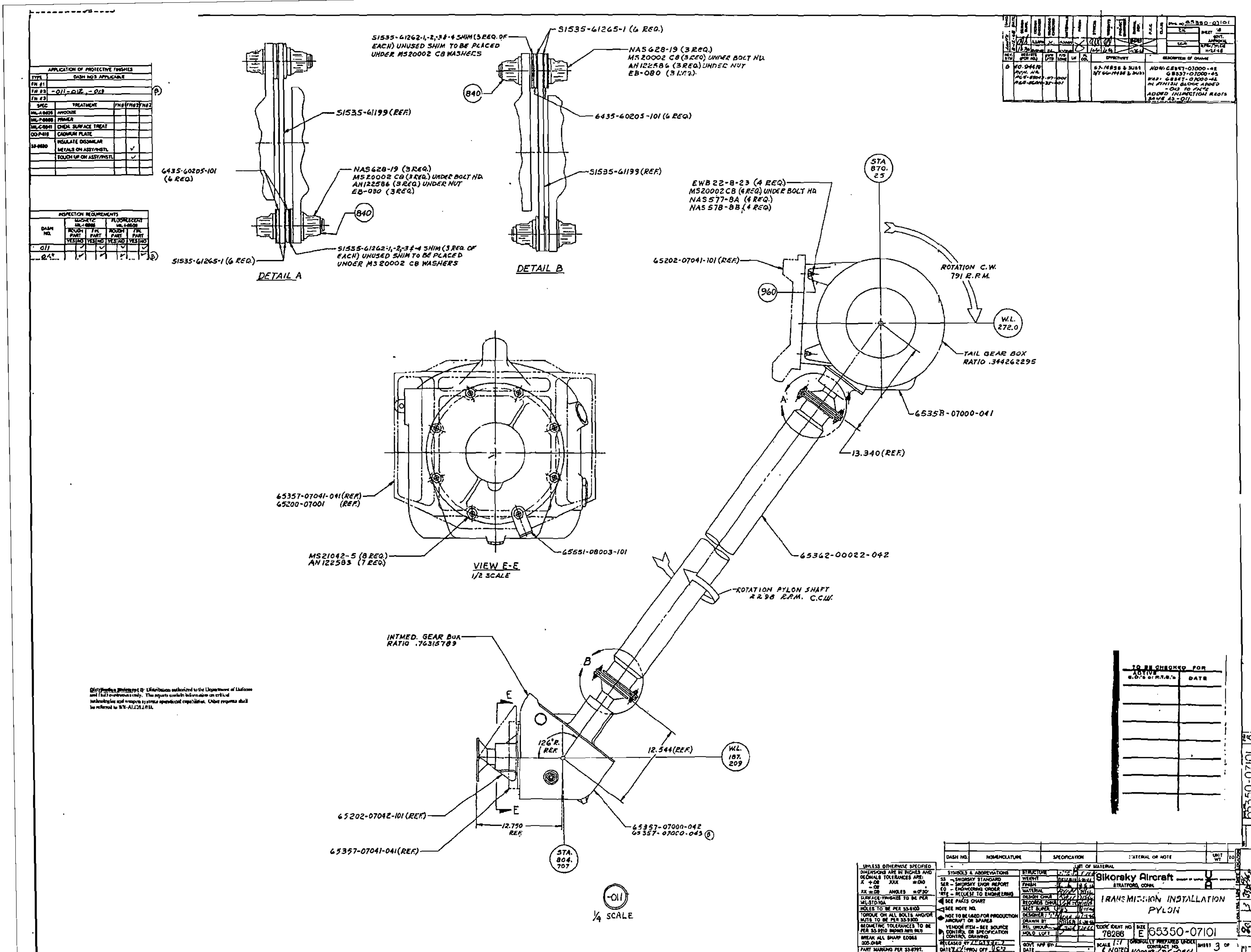
STRUCTURE / WEIGHT / FINISH / MATERIAL / DESIGN CHKR / RECORDS CHKR / SECT SUPER / DESIGNER / DRAWN BY / REL GROUP / MOLD LOFT
GOV'T APP BY
DATE

Sikorsky Aircraft
STRATFORD, CONN.

TRANSMISSION INSTALLATION
PYLON

CODE IDENT NO 78286 | SIZE E | 65350-07101
SCALE 1:1 & NOTED | ORIGINALLY PREPARED UNDER CONTRACT NO. | SHEET 3 OF

65350-07101 K


APPLICATION OF PROTECTIVE FINISHES
INSPECTION REQUIREMENTS
S1535-61262-1,-2,-3 & -4 SHIM (3 REQ. OF EACH) UNUSED SHIM TO BE PLACED UNDER MS20002 C8 WASHERS
S1535-61265-1 (6 REQ.)
NAS628-19 (3 REQ.) MS20002 C8 (3 REQ.) UNDER BOLT HD. AN122586 (3 REQ.) UNDER NUT EB-080 (3 REQ.)
S1535-61199 (REF.)
6435-60205-101 (6 REQ.)
840
DETAIL A
DETAIL B
STA. 870.25
EWB22-8-23 (4 REQ.) MS20002C8 (4 REQ.) UNDER BOLT HD. NAS577-8A (4 REQ.) NAS578-8B (4 REQ.)
65202-07041-101 (REF.)
960
ROTATION C.W. 791 R.P.M.
W.L. 272.0
TAIL GEAR BOX RATIO .344262295
65358-07000-041
13.340 (REF.)
65357-07041-041 (REF.)
65200-07001 (REF.)
MS21042-5 (8 REQ.)
AN122583 (7 REQ.)
VIEW E-E
1/2 SCALE
65551-08003-101
65362-00022-042
ROTATION PYLON SHAFT 2298 R.P.M. C.C.W.
INTMED. GEAR BOX RATIO .76315789
126° R. REF.
12.544 (REF.)
W.L. 187.209
65202-07042-101 (REF.)
12.750 REF.
65357-07000-042
65357-07000-043
65357-07041-041 (REF.)
STA. 804.707
-011
1/4 SCALE
TO BE CHECKED FOR ACTIVE
DATE
Sikorsky Aircraft
STRATFORD, CONN.
TRANSMISSION INSTALLATION PYLON
78286
E
65350-07101
SHEET 3

ENCLOSURE (1)
CDRL A004
Technical Report – Study/ Services

ENGINEERING ORDER

SIKORSKY AIRCRAFT Division of UNITED TECHNOLOGIES

SUBJECT OF CHANGE	FULL REASON FOR CHANGE	№ 41242
TRANSMISSION INSTL-PYLON	TO PREVENT NUTS FROM LOOSEN TORQUE	☐ SUPPLEMENTS ☐ CANCELS

MODEL	SHEET NO	DRAWING NUMBER	DASH NO		EFFECTIVITY FROM	EFFECTIVITY THRU	NEXT ASSEMBLY	QTY NA	QTY FA	REPLACES	WT CHG.
HH53B HH53C	2,3,	65350-07101			Any						NEG.

IN P/L SHT. #2, CHANGE AS SHOWN:

IN -011# -013 COLUMN:

(WAS) MS21042-5 NUT 8 REQ'D

(NOW) SS5086-05 NUT 8 REQ'D

IN F/D SHT #3, CHANGE AS SHOWN:

VIEW E-E

(WAS) MS21042-5 (8 REQ.)

(NOW) SS5086-05 (8 REQ.) (145/140)

Distribution Statement D: Distribution authorized to the Department of Defense and DoD contractors only. The reports contain information on critical technologies and weapon systems operational capabilities. Other requests shall be referred to WR-ALC/LUH.

CODE IDENT. NO. 78286

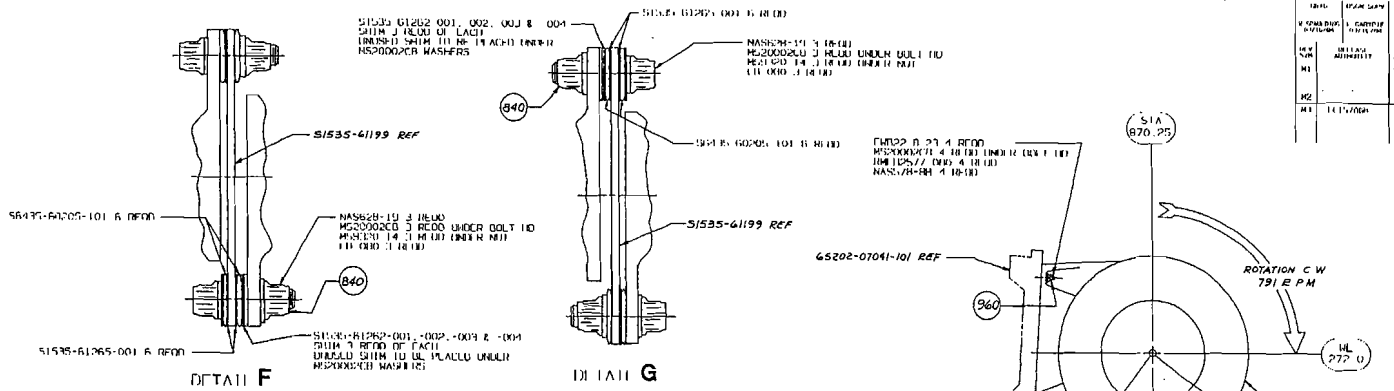
TDM 6/18/76

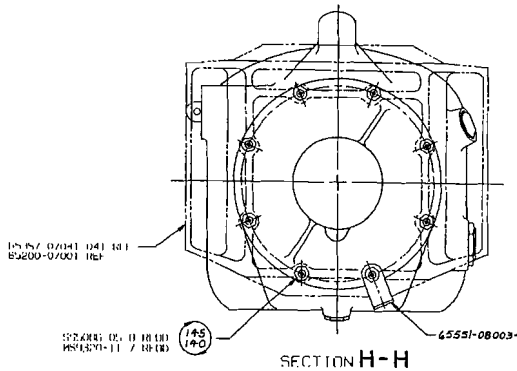
THE ABOVE INFORMATION HAS BEEN INPUT TO PART &. ☐ YES ☐ NO	ITEM NO.	PART NUMBER	USED ON MODEL	EFFECTIVITY FROM	EFFECTIVITY THRU	REPLACED

REQUESTED BY	SHOP CONTACT	DESIGN SUPERVISOR	DESIGN CHECKER	RECORDS CHECKER	MATERIALS	FINISHES	STRUCTURES ANALYST	STRUCTURES SUPERVISOR	
F. Rosman	BY	MANCINI	F. Rosman	F. Rosman	F. Rosman	X		MANCINI	☐ LINE STOPPAGE ☐ PRELIMINARY Advance Copies Void After
DATE 5/27/76	DATE	5/27/76	5-27-76	5-27-76	5-27-76	X		5/27/76	☐ DEO

PREPARED BY	MASS PROPERTIES	SYSTEMS ENGINEER	TASK MANAGER	CMM	GOVERNMENT	RELEASE GROUP	INCORPORATE ON DRAWING	CLASS	RELEASED BY
DATE 5/27/76	BY						☒ YES ☐ NO	II	☐ OMRA ☐ EI ☐ ERN ☒ MINOR
TEL. EXT. 2102	DATE		6-1-76		6-7-76	6/18/76			No.

SEE DRAWING RELEASE SYSTEM FOR APPROVALS





NOTES:

1. SEE SEPARATE APPLICATION LIST FOR MODEL AND EFFECTIVITY

QUERY DRAWING RELEASE SYSTEM FOR APPROVALS

QUERY DRAWING RELEASE SYSTEM FOR APPROVALS

SEE SEPARATE PARTS LIST

Sikorsky

TRANSMISSION INSTALLATION PYLON

E | 78286 | 65350 07101 | H

ITEM NO.	PART NO.	USED ON MODEL	EFFECTIVITY FROM	EFFECTIVITY THRU	REPLACED BY PART NO.

DWG NO. 65350-07101 SHEET 2

ORIG.	DATE	DESIGN SUPV.	DESIGN CHECKER	RECORDS CHECKER	MATERIALS	FINISH	STRESS	WEIGHTS	PROJECT ENGINEER	ENGRG. REP.	P.C.C.	CLASS
DELESSIO	12-20-67	12-22		1-5-68			1-5-68	2/19/68	2-19-68			II

REV. SYM	SEO/RTE (PCN NO.)	SWN LFTD	P/D ZONE	LM	PL COL	EFFECTIVITY	DESCRIPTION OF CHANGE
A1	E.O. 73781 EGA-19005-35-001				X	66-14428 - SUBS	NO CHG REQ'D. THIS E.O. CANCELED BY E.O. 79649.
A2	79649 EGA-19005-35-002	X	X	X	✓	66-14428 & SUBS	THIS E.O. CANCELS E.O. 73781, NO CHG REQ PER J. DELESSIO

NOTES

1. P/F ELASTIC STOP NUT CORP.
2. P/F STANDARD PRESSED STEEL CO.

QTY	QTY	QTY (-011)	SYMBOLS	CODE IDENT NO.	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
		6	1	72962	EB-080	NUT	.035	
		4	2	56878	EWB 22-8-23	BOLT	.16	
		10			MS 20002C8	WASHER	.007	
		8			MS 21042-5	NUT	.006	
		6			NAS 628-19	BOLT	.148	
		4			NAS 578-8B	RETAINER	.019	
		4			NAS 577-8A	BARREL NUT	.006	
		6			AN122586	WASHER	.006	
		7			AN122583	WASHER	.003	
		12			6435-60205-101	WASHER	.03	

PARTS LIST

QTY	QTY	QTY (-011)	SYMBOLS	CODE IDENT NO.	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
		12			S1535-61265-1	WASHER	.09	
		6			S1535-61262-4	SHIM	.03	
		6			S1535-61262-3	SHIM	.01	
		6			S1535-61262-2	SHIM	.01	
		6			S1535-61262-1	SHIM	.01	
		1			65551-08003-101	BRACKET	.012	
		1			65362-00022-042	PYLON SHAFT ASS'Y	19.27	
		1			65358-07000-041	TAIL GEAR BOX	155.58	
		1			65357-01000-042	INTMED. GEAR BOX	71.15	
					65350-07101-012	TRANS INSTL PYLON	249.23	
					65350-07101-011	TRANS. INSTL PYLON	249.23	

PARTS LIST

DWG NO 65350-07101 SYM A

SYMBOLS & ABBREVIATIONS
- SS – SIKORSKY STANDARD
- SER – SIKORSKY ENGRG REPORT
- EO – ENGINEERING ORDER
- RTE – REQUEST TO ENGINEERING
- ◀ SEE PARTS CHART
- ◁ SEE NOTE NO.
- ◆ NOT TO BE USED FOR PRODUCTION AIRCRAFT OR SPARES
- ▶ VENDOR ITEM – SEE SOURCE CONTROL OR SPECIFICATION CONTROL DRAWING

WEIGHT	DELESSIO	7-1-66
RECORDS CHKR		7-14-66
SECT SUPER.		7-5-66
DESIGNER		7-1-66
DRAWN BY	DELESSIO	7-1-66
REL GROUP		8-24-66

RELEASED BY EI 6511-00-7 DATE 8-25-66 PROJ OFF

GOVT APP BY

DATE

Sikorsky Aircraft DIVISION OF UNITED AIRCRAFT CORPORATION
STRATFORD, CONN.

TRANSMISSION INSTL PYLON

CODE IDENT NO. 78286 SIZE C 65350-07101

SCALE NONE ORIGINALLY PREPARED UNDER CONTRACT NO. N00019-67C-0401 SHEET 2 OF

SA-5083 REV. A

PARTS CHART					
ITEM NO.	PART NO.	USED ON MODEL	EFFECTIVITY FROM	EFFECTIVITY THRU	REPLACED BY PART NO.

CHKD	DATE	DESIGN SUPV.	DESIGN CHECKER	RECORDS CHECKER	MATERIALS	FINISH	STRESS	WEIGHTS	PROJECT ENGINEER	ENGRG REP.	P.C.C.	CLASS
Lantz	8-12-68	AJS 11-3?	X R.L.	GR 8-22-68	X R.L.	—				11-25-68		

DWG. NO. 65350-07101
SHEET 2
C.N.
C.C.N.
GOVT. APPROVAL: HPRO/[illegible] 11-25-68

REV. SYM	SEO/RTE (PCN NO.)	SWN LFTD	F/D ZONE	LM	PL COL.	EFFECTIVITY	DESCRIPTION OF CHANGE
B	EO-94419 PG5-55043 -07-001. PG6-56010 35-001				Y	GT-14993 & SUBS S/T GG-14455 & SUBS	CREATED: -013 ASSY. SAME AS -011 ASSY EXCEPT ADDED: 65357-07000-043 INTERMEDIATE GEAR BOX. 1 REQ. REMOVED: 65357-07000-042 INTERMEDIATE GEAR BOX. 1 REQ.

Distribution Statement D. Distribution authorized to the Department of Defense and DoD contractors only. The reports contain information on critical technologies and weapon systems operational capabilities. Other requests shall be referred to WR-ALC/LUHJ.

TO BE CHECKED FOR ACTIVE E.O.'s or R.T.E.'s	DATE

NOTES

1. P/F ELASTIC STOP NUT CORP.
2. P/F STANDARD PRESSED STEEL CO.

QTY	QTY	QTY	◆	▶	◁	◀	CODE IDENT NO.	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
6		6			1		72962	EB-080	NUT	.035	
4		4			2		56878	EWB 22-8-23	BOLT	.16	
10		10						MS 20002C8	WASHER	.007	
8		8						MS 21042-5	NUT	.006	
6		6						NAS 628-19	BOLT	.148	
4		4						NAS 578-8B	RETAINER	.019	
4		4						NAS 577-8A	BARREL NUT	.006	
[illegible]		6						AN122586	WASHER	.006	
7		7						AN122583	WASHER	.003	
12		12						6435-60205-101	WASHER	.03	
		-011	← DASH NO.					PARTS LIST			

QTY	QTY	QTY	◆	▶	◁	◀	CODE IDENT NO.	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
12		12						S1535-61265-1	WASHER	.04	
6		6						S1535-61262-4	SHIM	.03	
6		6						S1535-61262-3	SHIM	.01	
6		6						S1535-61262-2	SHIM	.01	
6		6						S1535-61262-1	SHIM	.01	
1		1						65551-08003-101	BRACKET	.012	
1		1						65362-00022-042	PYLON SHAFT ASS'Y	19.27	
1		1						65358-07000-041	TAIL GEAR BOX	155.58	
1		—						65357-07000-043	INTERMEDIATE GEAR BOX		
—		1						65357-07000-042	INTMED. GEAR BOX	71.15	
								65350-07101-012	TRANS INSTL PYLON	249.23	
								65350-07101-011	TRANS. INSTL PYLON	249.23	
(B) -013		-011	← DASH NO.					PARTS LIST			

SYMBOLS & ABBREVIATIONS
SS – SIKORSKY STANDARD
SER – SIKORSKY ENGRG REPORT
EO – ENGINEERING ORDER
RTE – REQUEST TO ENGINEERING
◀ SEE PARTS CHART
◁ SEE NOTE NO.
◆ NOT TO BE USED FOR PRODUCTION AIRCRAFT OR SPARES
▶ VENDOR ITEM – SEE SOURCE CONTROL OR SPECIFICATION CONTROL DRAWING

WEIGHT	DELESSIO	7-1-66
RECORDS CHKR	[illegible]	7-24-66
SECT SUPER.	[illegible]	7-5-66
DESIGNER	[illegible]	7-1-66
DRAWN BY	DELESSIO	7-1-66
REL GROUP	[illegible]	7-29-66

RELEASED BY CF6511-00-7
DATE 8-2-66 PROJ OFF 9521
GOVT APP BY
DATE

Sikorsky Aircraft DIVISION OF UNITED AIRCRAFT CORPORATION
STRATFORD, CONN.

TRANSMISSION INSTL PYLON

CODE IDENT NO.	SIZE	
78286	C	65350-07101

SCALE: NONE
ORIGINALLY PREPARED UNDER CONTRACT NO. Noa(s)[illegible]
SHEET 2 OF

SYM B
DWG NO 65350-07101

35G

S4-5083 REV A

Warner Robins Air Logistic Center
Engineering Report
Aircraft 69-05794 Mishap
7 September 2007

Background Information: The crew experienced a problem in a hover after overshooting the desired landing zone. The pilot in command took the controls and executed a right turn to return to the landing zone. During the execution of the emergency landing the aircraft landed hard causing extensive damage to the airframe.

Physical Evidence and Analysis: This section presents observations of the physical evidence and in some cases a factual analysis of the significance of the evidence with the main area of concentration being the transmission system. Not all aircraft airframe and system discrepancies, or lack thereof, observed are discussed herein.

Discussion: Numerous parts from mishap aircraft S/N 69-05794 had been shipped to Sikorsky Aircraft Corporation (SAC) and then later to the Fleet Readiness Center (FRC) East at Cherry Point, N.C. for evaluation in an effort to determine a possible cause of the mishap. A full list of the parts shipped to SAC for evaluation can be found in Tab Q. Parts shipped to FRC East include: Intermediate Gear Box (IGB), Tail Gear Box (TGB), Tail Rotor Head, Tail Rotor Blades, #1, #2, # 3, #4, #5, #6, and # 7 Drive Shaft, Main Gear Box Tail Take Off Gear, IGB Mount Bracket, IGB Armor plate and mount brackets. A full report verifying material type and modes of failure has been submitted by SAC.

Components:

1) Intermediate Gear Box (IGB):

The IGB had been disassembled for evaluation. The center housing had cracked during the mishap and mechanical cuts were taken of the housing material to evaluate the nature of the crack. Two cracks were found in the IGB center housing 180° apart from each other. The location of the cracks, using aircraft coordinates, are in the top left quadrant and the bottom right quadrant. Each crack progressed through an IGB mount hole. The mount holes serve a dual purpose, not only to attach the input housing to the center housing but also to mount the IGB to the airframe. Investigation by Sikorsky Aircraft showed that the cracks were a result of ductile overload and that no pre-existing conditions such as casting anomalies, fatigue cracking or corrosion existed (ref. Sikorsky Metallurgical Report SEL-9364). Close examination of the holes showed that the top left hole threads had no signs of damage (no threads stripped in the housing) indicating that the housing had cracked and separated prior to removal of the stud. Threads in the bottom right hole were stripped in the housing where the stud had pulled partially out. Fretting was observed on the sealing bores of the center and input housings. The fretting was found on the left side

of the bore. Fretting generally occurs between two surfaces in contact under load subject to repeated relative motion between the surfaces. Fretting could induce fatigue cracking although additional metallurgical analysis by Sikorsky Aircraft of the center housing did not show signs of fatigue. The input and output gears were examined. Both gears showed damage to the teeth with the greatest damage common to the input gear. The majority of damage common to both gears was restricted to the tips (outside diameter) of the gear teeth. Additional damage existed on the input gear common to the face of the gear teeth and appears to be from abnormal wear. The input gear had up to .12 inch missing from the tip of the teeth towards the root of the gear. The output gear had a "shaving" (.01 - .03 material removed) of material off of the tips common to the majority of the teeth. One tooth common to the output gear had a distinct impression (witness mark) in the tip that appears to be from contact with the input gear. Magnetic Particle Inspection of the output gear revealed numerous cracks at the roots of the teeth, 23 out of 30 teeth (approximately 75 percent) exhibited root cracking. Destructive testing was not accomplished on either of the gears. The damage found in the IGB gears is consistent with the center housing separating from the input housing thereby allowing the gear teeth to disengage and grind the tips of each other. Additionally, a cracked center housing would allow the housing to expand causing a displacement between the input and output gears. The SAC report states "Most of the IGB gears teeth exhibited shearing and smearing damage at the crests due to skipping, in the drive direction" and that the damage to the gears "happened in a relatively short time as there was no evidence of fatigue". Gear skipping may have caused the transmission system to load and unload. This rapid application and removal of load could result in transient droop or overshoot of power turbine speed. The cracks at the roots of the output gear are likely due to sudden engagement of the gear causing a very high impact load.

The IGB is protected from ballistic rounds by armor plate. The armor covers the bottom and the lower sides of the IGB and is fabricated from .25 thick 6AL-4V Titanium plate per MIL-T-46077. It is attached to the IGB using two (2) brackets fabricated from .063 thick 4130 Normalized steel per MIL-S-18729. The brackets found on the mishap aircraft were fabricated from .071 thick steel with an equivalent to slightly reduced hardness than the drawing requirement. As stated earlier, analysis of the IGB input and output gears revealed a "shaving" of the tips of the gear teeth consistent with the center housing separating from the input housing. It was noted during the post crash investigation that rotation the tail rotor head showed a no-load continuity of the drive through the TGB, pylon shaft (#7), IGB, disconnect coupling, and the #6, #5, #4, and #3 driveshafts. It is evident that at some point after separating, the gears became re-engaged. The armor plate may have assisted with the re-engagement of the gears and could have prevented total separation of the IGB since it is attached to both the input and output housing while spanning the center housing.

A drawing and Technical Order review of the IGB installation was conducted. A review of the IGB installation procedures contained in TO 1H-53(M)J-2-4 revealed the torque required for the mount nuts common to the center housing studs to be 200 inch-pounds. A subsequent review of the Sikorsky Aerospace drawing 65350-07101

revealed the torque required for the same nut/stud to be 140 to 145 inch-pounds. This conflict was due to a drawing change that occurred after release of the TO. The drawing was updated in June 1976 at which time it added the 140/145 inch-pound torque per EO 41242, this was a Class II change. The reason for the change was "To Prevent Nuts From Loosen Torque". Updates to drawings for Class I changes are normally accomplished through a proposed modification (e.g. Engineering Change Proposal (ECP)) that identifies changes to the system/end-item configuration that affect form, fit, function, or interface. Drawing numbers, part numbers, serial numbers, etc., as well as technical order changes, are reflected in the ECP. Upon receipt and review of the ECP, the configuration control authority convenes a configuration control board (CCB) to evaluate the change. If the board approves the change, the contractor, usually, is responsible for updating records, drawings, and technical data necessary to accurately reflect the current configuration. Updating should include the complete incorporation of the changes into the drawings, associated lists, part numbers, and engineering technical data.

A Class II change on the other hand, is typically reviewed for concurrence in classification by the local government representative. Unless a government representative is identified in the contract (normally a person from the procuring activity), the Contractor (or ECP originator) is responsible for assigning change classification. If the USAF has a sustainment contract with an OEM to deliver drawing updates, (currently there is not such a contract in place regarding the MH-53 Helicopter), the received drawings are put into the Joint Engineering Data Management Information and Control System (JEDMICS) without a technical review.

2) Tail Gear Box (TGB):

The TGB had been disassembled for evaluation. Unlike the IGB no cracks were found in the housing. The input and output gears were examined. Both gears showed damage to the teeth with the input gear showing a greater extent of damage. Very light marks from gear teeth impressions from the input gear could be seen on the drive side face of output gear teeth. Heavy damage was primarily common to the tips of the gears although severe wear can be seen on the face of numerous teeth on the input gear. Magnetic Particle Inspection showed the existence of two cracks common to the roots of the teeth on the TGB input gear. Neither gear had been destructively tested. The Sikorsky Metallurgical Report (ref SEL-9364) stated that the tooth damage was due to an overload event that happened in a relatively short time with no evidence of fatigue or of progressive long term failure mechanism.

A bearing was sent from Sikorsky to their supplier (MRC Bearings Inc) for testing. Part number for the bearing is SB1127-1. This bearing is the most outboard bearing common to the TGB housing. It was reported by Sikorsky that this bearing had made an unusual noise when tested by their supplier. Additional analysis of the bearing at Cherry Point revealed the following: Radial play and ID/OD dimensions were generally conforming. The bearing did not have any notable raceway degradation other than hard particle debris denting. No functional deterioration was

noted. The oil deposits on the cage and outer ring was contaminated with a fine black debris and the lands of the outer ring were stained black. The running surfaces (rings and rollers) were darkened but not as black as the lands. The OD of the outer ring showed a 360 degree blackened ring (suspect fretting wear but it is a bit different than classic fretting). Overheating was found in the bore of the TGB housing common to the installation location of the bearing. There was no evidence that the bearing contributed to the mishap.

3) Tail Rotor Head:

A visual examination was made of the Tail Rotor Head. There was no apparent damage noticed with the exception of the "crown" fitting (cam assembly). This fitting faces the TGB and is used to keep the tail rotor blade from rotating when the tail is folded. The fitting had rub marks on the outside diameter and had a cracked flange that appears to be from contact with the spindle assembly.

Additional discrepancies were found common to the keyed washer for the pitch change shaft. This washer shows that the pitch beam translated in advance of the pitch change shaft by approximately 20 degrees. This means that the shaft lagged or stopped and that the pitch beam continued to rotate another 20 degrees.

The Tail Rotor Head does not appear to have been a factor in the mishap.

4) # 3 Drive Shaft:

A visual examination was made of the # 3 Drive Shaft. The forward flange retention nut had separated from the shaft due to static tensile overload which allowed the shaft to disengage from the splined connection common to the #2 shaft. The nut threads were stripped. There was also damage to the internal gears common to the end fitting. All damage appears to be a result of sudden impact. This overload most likely occurred at the time of initial aircraft impact, drive to the Tail Gear Box ceased at this time. The lack of damage common to the tail rotor blades (see 8)) confirms this. No defects were noted that may have contributed to the mishap.

5) #1, #2, #4, #5, #6, # 7 Drive Shafts:

A visual examination was made of noted Drive Shafts. Other than minor circumferential scarring there were no notable defects found common to these drive shafts. No defects were noted that may have contributed to the mishap.

6) Main Gear Box:

An external visual examination revealed that the Main Gear Box had no notable defects. Gears rotated freely by hand. A teardown and examination of the internal components was completed by Sikorsky Aircraft and their primary MGB overhaul source during the week of Nov 7, 07. No additional defects were found that may have contributed to the mishap.

7) Main Rotor Head:

The Main Rotor Head was damaged significantly. An elastomeric bearing had separated into two pieces. Numerous pitch change rods and damper assemblies were damaged. One yoke assembly had fractured common to the upper and lower lugs. All of the damage observed is consistent with sudden impact forces. No notable defects were found that may have contributed to the mishap.

8) Tail Rotor Blades:

The Tail Rotor Blades exhibited either no apparent impact damage, or were bent in a spanwise direction commencing from the blade tip. Two of the tail rotor blades showed spanwise damage and can to be attributed to the separation of the tail section and final impact of the tail blades with the ground. Two of the blades showed no damage at all. No deformation signature consistent with blade rotation was observed as there was no leading edge or tip cap damage on any of the blades. This is consistent with the separation of the #2 and #3 Drive Shafts. No defects were noted common to the Tail Rotor Blades that may have contributed to the mishap.

James Sawinski
Aerospace Engineer
WR-ALC 580 ACSSS/GFEAD
(478) 327-6950

H53 ISSC Evaluation of Submitted Mishap Parts for Air Force MH-53M Aircraft 69-05794 Summary of findings as of 12/20/07

The USN H53ISST was asked to evaluate a group of dynamic components and drive system components from AF mishap aircraft MH-53M, 69-05794. The submitted items were:

Tail Rotorhead with Blades
Tail gearbox
Intermediate Gearbox
Tail Driveshafts Numbers 3 & 7
Main Gearbox Tail Drive Output Gear

1. Tail Rotorhead was examined and no anomalies were noted that would prevent normal function. The sleeves and spindles were intact and could be freely rotated. All pitch change links and the pitch beam were attached. The tail rotor positioning cam showed rotational damage and had a broken lobe. When received the tail rotor blades had been removed from the tail rotorhead but it is understood that they were attached at the site of the mishap. The tail rotor blades were intact and relatively free of damage indicating a low energy impact and low to no rpm impact. All damage noted was consistent with these small impact forces.

2. The Tail Gearbox (TGB) was examined. The gearbox had been disassembled prior to arriving. Both the input and output gears showed a large amount of damage. There were numerous chips within the gearbox housings. The driven side of both gears showed two distinct scuffing patterns, one on the high side of the tooth flank and the one on the low side. The middle of the teeth, where normal contact occurs, was relatively free of damage except for debris denting. The top of most of the teeth of both gears had heavy amounts of damage. The non-driven side of both gears had heavy scuffing indicative of a lack of backlash or the gears being backdriven. The bearings were examined and only debris denting was noted. The gearbox was reassembled using existing shims. Drive continuity was evident even with the large amount of tooth damage. A pattern check was made and showed normal mid tooth contact. The gears showed no evidence of running out of mesh and appeared to be capable of transmitting torque at time of impact.

3. The Intermediate Gearbox (IGB) was received in a disassembled state. Extensive damage of all the gear teeth was noted on both gears. A large amount of metal debris remained in the housings. The input housing mounting studs located on the forward side on the IGB center housing showed various states of failure. All of the damage to the studs was consistent with impact related overload. The Center Gearbox housing had been sectioned by Sikorsky at an area where the housing had a crack. The crack was due to overload. A casting anomaly was noted in the threaded hole for the #1 stud. The anomaly was a sand inclusion that would have exceeded acceptance criteria. It is not thought that this anomaly is related to the cracking of the gearbox housing or the mishap. Both of the gears in the IGB showed damage to the teeth indicative of the gears coming out of mesh

and over-riding each other. It is considered that this would have occurred during impact when the gearbox housing split open. No cause for the opening of the gearbox was seen that was thought to have occurred prior to impact. The drive side of the gears showed a normal running pattern.

4. The #3 and the #7 tail drive shafts were examined. The #3 shaft forward flange retention nut had separated due to static overload. The #7 shaft was relatively undamaged. Driveshafts were capable of transmitting torque until time of impact. The number 3 driveshaft was subjected to impact force severe enough to cause static overload of the retention nut at which time the rest of the tail drive system would have been un-driven.

5. Conclusions. All damage noted is considered related to impact forces and no causal factors were seen for the items submitted.

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ISSC Cherry Pt. NC
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William.e.hood@navy.mil

P 021620Z JAN 08 ZYB
FM COMNAVAIRSYSCOM PATUXENT RIVER MD//DRPO// TO AFSOC HURLBURT FLD FL//PMA// INFO OC-ALC TINKER AFB OK//LPARP// COMNAVAIRSYSCOM PATUXENT RIVER MD//DRPO/4.4.3.2// //N04790// MSGID/GENADMIN/COMNAVAIRSYSCOM PAX DRPO// SUBJ/MH-53J EI FINAL REPORT// REF/A/MSG/COMNAVAIRSYSCOM PATUXENT RIVE/021810ZOCT2007// REF/B/MSG/COMNAVAIRSYSCOM PATUXENT RIVE/101820ZOCT2007// REF/C/DOC/COMNAVAIRFORINST 4790.2 CH-1/01MAY2006// REF/D/DOC/OPNAVINST 3750.5C/21JUN2005// REF/E/DOC/OPNAVINST 5102.1C/01NOV2001// REF/F/DOC/NA 02B-105AJB-6-2/01FEB2006// REF/G/DOC/NA 02B-105AJB-6-1CHG 3/01MAR2007// NARR/REF A IS EI REQUESTING MESSAGE REF B IS EI PRELIMINARY REPORT REF C IS NAVAL AVIATION MAINTENANCE PROGRAM INSTRUCTIONS REF D IS NAVAL AVIATION SAFETY INSTRUCTIONS REF E IS MISHAP INVESTIGATION INSTRUCTIONS REF F IS T64 DEPOT MAINTENANCE MANUAL REF G IS T64 INTERMEDIATE MAINTENANCE MANUAL// POC/LUCAS, CHRIS/-/NAVAIRDEPOT CHERRY PT NC/LOC:H53ISST.6 /DSN:451-7127/TEL:252-464-7127// RMKS/THIS MESSAGE WAS AUTO GENERATED FROM THE NAMDRP WEBSITE FOR NON-WEB SITE CAPABLE ORGANIZATIONS. THE REPORT WAS ORIGINATED BY: ------ NAVAIRDEPOT CHERRY PT NC/4.4.8.2.
IF RESPONSE VIA WEB SITE IS NOT POSSIBLE, TO: LINE RECIPIENTS SHOULD ADDRESS RESPONSE DIRECTLY TO: ------ NAVAIRDEPOT CHERRY PT NC/4.4.8.2 WHEN APPROPRIATE. THIS DISCREPANCY REPORT WILL BE PROCESSED VIA THE NAMDRP WEBSITE. FOR FURTHER DETAILS OR REAL TIME STATUS VISIT THE NAMDRP WEB SITE AT: NAMDRP.NAVAIR.NAVY.MIL.
1. H53ISST.6/65923
2. F44170-07-366
3. AIRCRAFT T/M/S: N/A, BUNO: 000000, NOMENCLATURE: T64-GE-100 TURBOSHHAFT ENGINE, P/N: 6063T02G01, S/N: 261008, LOT/BATCH NR: NA, NSN: - , CONTRACT NR: N/A, WUC: 22000
4. NAVAIRDEPOT CHERRY PT NC
5. ICN: WC2EI-T64-0009-07M
6. TIME SINCE NEW: UNK TIME SINCE REWORK: 892.9 7. LAST REPAIR DATE: NA 8. BACKGROUND: ENGINE WAS INVOLVED IN AIRCRAFT HARD LANDING. AIR FORCE MISHAP SAFETY BOARD REQUESTED INVESTIGATION OF ENGINE FOR OPERATIONAL CAPABILITY. REF A REQUESTED EI. REF B ASSIGNED EI AND PROVIDED SHIPPING INSTRUCTIONS IN ACCORDANCE WITH REF C THROUGH E.
9. DESCRIPTION OF FINDINGS: A. ENGINE WAS EXAMINED AS RECEIVED. NO LOG BOOK WAS PROVIDED WITH THE ENGINE. THE ENGINE WAS INSTALLED IN A HORIZONTAL MAINTENANCE STAND AND A BORE SCOPE WAS USED TO INSPECT THE INLET AND EXHAUST. NO FOD DAMAGE WAS SEEN ON THE COMPRESSOR OR 4TH STAGE TURBINE BLADES.
B. THE GAS GENERATOR AND POWER TURBINE ROTATED FREELY WITH NO UNUSUAL NOISES.
C. THE VARIABLE GEOMETRY SYSTEM WAS INSPECTED FOR RIG AND FREEDOM OF MOVEMENT. THE FEEDBACK CABLE ARM ON THE FUEL CONTROL WAS STIFF WHEN EXERCISED BY HAND BUT MOVED TO POSITION AS REQUIRED WHEN OPERATED BY THE VARIABLE GEOMETRY ACTUATORS.
D. THE FEEDBACK CABLE RIG WAS CHECKED WITH THE RIG PIN AND FOUND TO BE AT NOMINAL RIG.
E. THE VARIABLE GUIDE VANE SCHEDULE WAS CHECKED. RESULTS ARE AS FOLLOWS: IGV OPEN: 10 MINUTES OUT OF TOLERANCE LEFT SIDE, 5 MINUTES OUT OF TOLERANCE RIGHT SIDE IGV CLOSED: 10 MINUTES OUT OF TOLERANCE LEFT SIDE, IN TOLERANCE ON RIGHT SIDE. STAGE ONE OPEN: IN TOLERANCE LEFT SIDE, 45 MINUTES OUT OF TOLERANCE RIGHT SIDE. STAGE ONE CLOSED: 30 MINUTES OUT OF TOLERANCE LEFT SIDE, 1 DEGREE 30 MINUTES OUT OF TOLERANCE RIGHT SIDE. STAGE TWO OPEN: IN TOLERANCE LEFT SIDE, IN TOLERANCE RIGHT SIDE. STAGE TWO CLOSED: 1 MINUTE OUT OF TOLERANCE LEFT SIDE, IN TOLERANCE RIGHT SIDE. STAGE THREE OPEN: IN TOLERANCE LEFT SIDE, IN TOLERANCE RIGHT SIDE. STAGE 3 CLOSED: 15 MINUTES OUT OF TOLERANCE LEFT SIDE, 45 MINUTES OUT OF TOLERANCE RIGHT SIDE. STAGE 4 OPEN: IN TOLERANCE LEFT SIDE, IN TOLERANCE RIGHT SIDE. STAGE 4 CLOSED: 5 MINUTES OUT OF TOLERANCE LEFT SIDE, 10 MINUTES OUT OF TOLERANCE RIGHT SIDE.
F. THE FUEL CONTROL FUEL DENSITY SELECTOR WAS SET TO THE NUMBER 6 SETTING.
G. THE FLOW DIVIDER FILTER BOWL WAS REMOVED AND INSPECTED. A SAMPLE OF FUEL WAS RETRIEVED FOR ANALYSIS AND THE FILTER INSPECTED. NO ABNORMAL FINDINGS NOTED.
H. THE CHIP DETECTOR WAS INSPECTED. A SLIGHT AMOUNT OF SLUDGE COVERED THE TIP.
I. THE ENGINE WAS INSTALLED IN THE TEST CELL. ALL SYSTEMS PERFORMED NORMAL DURING A MOTORING CHECK. THE GUIDE VANES MOVED TO THE CAMBERED POSITION (CLOSED) AND THE ENGINE

TURNED WITH NO ABNORMAL NOISES TO MAXIMUM STARTER SPEED, APPROXIMATELY 5000 RPM. THE ENGINE WAS ALLOWED TO COAST DOWN. AT APPROXIMATELY 2000 RPM THE ENGINE VIBRATED BACK AND FORTH IN THE STAND WITH MAXIMUM MOVEMENT AT THE TAIL PIPE. HOWEVER, THIS DID NOT REGISTER ON THE VIBRATION PICKUPS AS AN OUT OF LIMITS VIBRATION. THE VIBRATION COULD BE SEEN AS THE ENGINE MOVED BACK AND FORTH AT THE TAIL PIPE. THE TYPICAL ENGINE DOES NOT DO THIS, BUT IT IS POSSIBLE TO PHYSICALLY GRASP THE TAILPIPE AND SHAKE THE ENGINE WHILE INSTALLED IN THIS TEST STAND. SINCE THIS BEHAVIOR OF AN ENGINE HAS NOT BEEN WITNESSED TO THIS DEGREE THE DECISION WAS MADE NOT TO START THE ENGINE DUE TO THE POSSIBILITY OF DAMAGING THE ENGINE OR TEST CELL OR LOOSING INFORMATION RELATED TO THE AIRCRAFT HARD LANDING.

J. THE ENGINE WAS DISASSEMBLED IAW REF A AND B.

K. THE FUEL CONTROL WAS REMOVED AND TESTED ON THE FUEL CONTROL TEST STAND. ALL PARAMETERS WERE FOUND TO BE WITHIN LIMITS.

L. THE POWER TURBINE WAS REMOVED AND A RUN OUT CHECK WAS PERFORMED ON THE ASSEMBLY. THE RUN OUTS WERE WITHIN LIMITS. THE POWER TURBINE DRIVE SHAFT AND DISKS WERE CHECK BALANCED AND FOUND TO BE WITHIN LIMITS. THE POWER TURBINE FORWARD SPLINES WERE INSPECTED FOR WEAR AND/OR DAMAGE AND FOUND TO BE WITHIN LIMITS.

M. THE GAS GENERATOR TURBINE ROTOR WAS REMOVED AND CHECK BALANCED.
THE ROTOR BALANCE WAS WITHIN LIMITS.

N. THE STAGE ONE TURBINE BLADE TIPS EXHIBITED HEAVY METAL BUILD UP DUE TO CONTACT WITH THE STAGE ONE TURBINE SHROUDS. THE SHROUDS EXHIBITED HEAVY RUB FROM APPROXIMATELY 4 OCLOCK TO 7 OCLOCK. THE STAGE ONE STATIONARY AIR SEAL EXHIBITED MODERATE WEAR FROM THE STAGE ONE ROTATING AIR SEAL FROM APPROXIMATELY 4 OCLOCK TO 7 OCLOCK. THE INNER BALANCE PISTON SEALS HAD A SIMILAR APPEARANCE. THE STAGE 2 TURBINE BLADES HAD VERY SLIGHT METAL BUILDUP WITH MODERATE RUB ON THE STAGE 2 TURBINE SHROUDS, AT THE 4 OCLOCK TO 7 OCLOCK POSITIONS.

O. THE COMPRESSOR CASES WERE REMOVED. NO ABNORMALITIES WERE SEEN ON THE COMPRESSOR ROTOR, BLADES, CASES, OR VANES.

P. THE TORQUE SENSOR SHAFT WAS INSPECTED FOR MISALIGNED SENSOR AND REFERENCE TEETH. THE RUN OUT BETWEEN TEETH WAS FOUND TO BE WITHIN LIMITS.

Q. ALL THE MAIN BEARINGS WERE INSPECTED. THE NR 1 BEARING HAD NO DISCREPANCIES. THE NR 2 BEARING SHOWED SLIGHT DISCOLORATION BUT NO OTHER DISCREPANCIES. THE NR 3 BEARING HAD WHAT APPEARED TO BE SLIGHT INSTALLATION OR REMOVAL DAMAGE ON THE INNER RACE EDGE. THE NR 4 BEARING HAD NO DISCREPANCIES. THE AFT DIFFERENTIAL BEARING HAD INDICATIONS (VISIBLE SHINE OF NO APPARENT DEPTH) OF LOADING TO ONE SIDE OF THE RACEWAY.

R. A RUNOUT WAS PERFORMED ON THE GAS GENERATOR ASSEMBLY (COMPRESSOR MATED TO TURBINE). ALL RUNOUTS WERE WITHIN REF F REQUIREMENTS.

S. THE COMBUSTION CHAMBER AND FRAME AND NR 2 AND 3 BEARING SUPPORT WERE INSPECTED WITH A COORDINATE MEASUREMENT MACHINE FOR FLANGE/BEARING BORE ALIGNMENT. NO BEARING BORE MISALIGNMENT WAS DETECTED.

10. CONCLUSIONS: THOUGH THE ENGINE WAS NOT OPERATED ON THE TEST CELL IT IS APPARENT THAT THIS ENGINE WAS CAPABLE OF OPERATION AS REQUIRED. NO DISCREPANCIES WERE IDENTIFIED DURING DISASSEMBLY WHICH WOULD PREVENT NOMINAL OPERATION OF THE ENGINE. THE VANE ANGLES ARE NOT SUFFICIENTLY OUT OF TOLERANCE TO CAUSE COMPRESSOR OPERABILITY PROBLEMS. THE RUB ON THE TURBINE SHROUDS AND SEALS IS CONSISTENT WITH TURBINE ROTOR SHIFT AND/OR LOSS OF RUNNING CLEARANCE. THIS MAY BE THE RESULT OF LOADING DUE TO HIGHER THAN NORMAL G FORCE RELATED TO THE HARD LANDING. DURING THE LOADING THE CLEARANCES COULD NOT BE MAINTAINED AND THE BLADES AND SEALS MADE CONTACT WITH THEIR ASSOCIATED SHROUDS AND HONEYCOMB. CLEARANCE CLOSURE IS ALSO EXPECTED IN THIS AREA OF THE T64 DUE TO THE NUMBER 3 OIL DAMPENED BEARING AND THE LOSS OF BEARING CLEARANCE TO THE SUPPORT HOUSING DURING G LOADING. ADDITIONALLY, VISUAL CHARACTERISTICS (SHINE AND LACK OF SOOT OR CONTAMINANT DEPOSITS) OF THE RUB ON THE SEALS AND SHROUDS INDICATES THE ENGINE DID NOT OPERATE FOR AN EXTENDED AMOUNT OF TIME FOLLOWING THE RUB EVENT. THE ROTATING COMPONENTS IN BALANCE AND THE RUN OUTS OF THE SHAFTS AND TORQUE SENSOR SHAFT INDICATES THAT THE ROTOR GROUPS DID NOT SUSTAIN LOADS TO CAUSE PERMANENT DEFORMATION. CONSIDER BEARING FINDINGS TO BE NOMINAL FOR AN IN-SERVICE ENGINE. CONSIDER THE ENGINE VIBRATION WITNESSED DURING MOTORING TO BE UNRELATED TO MISHAP

EVENT. THERE IS NO EVIDENCE TO SUPPORT ENGINE VIBRATION DURING OPERATION PRIOR TO MISHAP, I.E. CRACKS IN VARIOUS LINE/HOSE BRACKETS OR EXCESSIVE WEAR ON MATING PARTS 11. RECOMMENDATIONS: NA 12. RELATED INFORMATION: GE AVIATION WAS CONTACTED TO PROVIDE INSIGHT INTO THE ENGINE VIBRATION DURING THE START ATTEMPT. THERE ANALYSIS INDICATES A VIBRATION MODE AT 2569 RPM WHICH RESULTS IN MAXIMUM AMPLITUDE AT THE ENGINE TAILPIPE. ADDITIONALLY, FURTHER OBSERVATION OF OTHER ACCEPTED ENGINES REVEALED THIS MODE BUT WITH LESS DISPLACEMENT AT THE TAILPIPE THAN THE MISHAP ENGINE. FST WILL MONITOR THIS MODE AND REPORT ANY FURTHER DEVELOPMENTS IF NECESSARY. AIB REQUESTED EXPLANATION OF T64 ENGINE GOVERNING PRINCIPALS OF OPERATION. THE T64 FUEL CONTROL UTILIZES A FLYWEIGHT GOVERNOR SYSTEM WHICH ACCEPTS A PHYSICAL RPM SIGNAL FROM A ROTATING FEEDBACK CABLE WHICH IS ATTACHED BETWEEN THE CONTROL AND AIRCRAFT NOSE GEARBOX. THE GOVERNOR FLYWEIGHTS ADJUST FUEL FLOW TO THE ENGINE (WHEN IN NF GOVERNING MODE) BASED ON THEIR CENTRIFUGAL MOVEMENT AT CHANGING SPEEDS. THE MOVEMENT OF THE FLYWEIGHTS ADJUSTS FUEL METERING VALVES WHICH SUPPLY FUEL TO THE ENGINE. IF THE HELICOPTER ROTOR HEAD SLOWS THE GOVENOR SLOWS WHICH DRIVES THE FLYWEIGHTS INWARD. THIS MOVEMENT CHANGES THE FUEL VALVE TO ALLOW MORE FUEL INTO THE ENGINE TO SPEED NG AND HENCE PROVIDE MORE COMBUSTION GAS TO THE POWER TURBINE WHICH WILL INCREASE TORQUE/ NF SPEED ON THE DRIVE SYSTEM. AS THE SPEED OF THE HELICOPTER RECOVERS FROM THE SLOW DOWN THE FLYWEIGHTS RETURN TO EQUILIBRIUM AND SCHEDULE THE NECESSARY FUEL FLOW TO MAINTAIN THE DESIRED HELICOPTER ROTOR SPEED. THIS CYCLIC OPERATION IS SMALL UNDER NORMAL CONDITIONS AND DAMPED. THIS RESULTS IN STEADY STATE ENGINE OPERATION HENCE A CONSTANT NF SPEED. THE CONTROL ALSO COMPUTES LOAD CHANGES AND ANTICIPATES THE CHANGE SUCH THAT ROTOR DROOP/SLOWING IS NOT SEEN BY THE PILOT UNDER NORMAL FLIGHT CONDITIONS. THE SYSTEM IS DESIGNED TO REACT TO NORMAL HELICOPTER FLIGHT OPERATIONS WHICH WERE DETERMINED IN DEVELOPMENT AND ANY SUBSEQUENT MODELING OR TESTING. IF THE GOVERNING SYSTEM IS EXPOSED TO TRANSIENT CONDITIONS WHICH ARE OUTSIDE OF THE DESIGNED/TESTED PARAMETERS ITS ABILITY TO REACT WITH PREDICTABLE RESULTS MAY BE COMPROMISED. IF AN OUTSIDE INFLUENCE EXISTED SUCH THAT THE HELICOPTER ROTOR SYSTEM WAS SUBJECTED TO A CYCLIC LOADING AND UNLOADING THE GOVERNOR WOULD REACT TO EITHER REDUCE FUEL FLOW TO THE ENGINE OR INCREASE FUEL FLOW TO THE ENGINE AS NECESSARY BASED ON HELICOPTER ROTOR SLOWING (DROOPING) OR ACCELERATING PASSED THE NF GOVERNOR SET POINT. THE CONTROL IS CAPABLE OF HANDLING SUCH INPUTS TO A POINT AS DESIGNED, BUT IF THE CYCLIC INPUT IS AT A FREQUENCY NOT ASSOCIATED WITH THE DESIGN OF THE GOVERNOR, THE GOVERNOR AND HENCE THE ENGINE ROTATING SYSTEM MAY NOT REACT WITH PRECISION TO OFFER A STEADY NF AND MAY IN FACT DIVERGE. IDENTIFICATION OF THE MODES/INPUTS AT WHICH THE GOVERNOR MAY DIVERGE WOULD NEED TO BE PERFORMED BY THE ENGINE AND AIRCRAFT OEM.
13. PENDING ACTIONS: NA
14. THIS IS CONSIDERED CLOSING ACTION ON EI RCN: F44170-07-366, INVESTIGATION CONTROL NUMBER WC2EI-T64-0009-07M.//

Sikorsky Aircraft Corporation
6900 Main Street- P.O. Box 9729
Stratford, Connecticut 06497-9129
(203) 386-4000

Sikorsky
A United Technologies Company

SEL-9396
07-AF-FA8509-0045

December 21, 2007

WR-ALC/LUHJE
235 Byron Street
Suite 19A
Robins AFB, GA. 31098-1622

Attention: Ray Goorah, MH-53J/M Project Engineer

Subject: Contract FA8509-05-C-0001, MH-53J/M Integrated Product Team Engineering Support

Reference: (a) Contract FA8509-05-C-0001, DD Form 1423-1, Contract Data Requirements List Item A004, Technical Report – Study / Services

Enclosure: (1) Sikorsky Aircraft teardown analysis of USAF MH-53M Mishap aircraft Main Gearbox

The Contractor hereby submits Enclosure (1) in accordance with the requirements of Reference (a).

The information contained in Enclosure (1) provides the results of the teardown analysis of a Main Gearbox Assembly, P/N 65351-11500-056. This assembly was installed on a USAF MH-53M aircraft, A/C 69-05794, while it encountered a hard landing mishap at Eglin AB, FL.

The enclosed Sikorsky proprietary data and intellectual property is provided voluntarily and in strict confidence at the request of the United States Air Force (USAF), and is accepted on that basis with the express agreement that this data will be restricted to the official use of the USAF and will not be released to any person outside the USAF without the prior written consent of Sikorsky Aircraft Corporation.

FOIA Exemption: This data is furnished in confidence and subject to exemption under sub-section (b) of 5 USC 552.

DECLARATION OF TECHNICAL DATA CONFORMITY

The contractor, Sikorsky Aircraft, hereby declares that, to the best of its knowledge and belief, the technical data delivered herewith under Contract FA8509-05-C-0001 is complete, accurate and complies with all requirements of the contract.

Date: 12-19-2007

Name and Title of Authorized Official:

Ralph D. Brunks Jr.
H-53/H-60 USAF Program Engineering Manager

ENCLOSURE (1)
CDRL A004

Sikorsky Aircraft Teardown Analysis of
USAF MH-53M Mishap Aircraft Main Gearbox

As part of the Mishap Investigation of MH-53M, A/C 69-05794, Sikorsky Transmissions Engineering evaluated the Main Gearbox Assembly, P/N 65351-11500, S/N A16-426. The evaluation results are detailed below.

Main Gearbox Assembly, P/N 65351-11500-056

The evaluation was conducted on 7 November 2007, at Overhaul Support Services (OSS), located at 18 Connecticut South Drive, East Granby, CT. Sikorsky employees, Chris Lowenstein, Alex Smith and William Meltzer were present during the gearbox teardown and evaluation. The controlled teardown/evaluation was performed per EI No.: E65D-725-35-041.

Note: A preliminary evaluation of MGB P/N 65351-11500, S/N A16-426, was conducted on 24 September 2007. See TSD&D-07-032 for details associated with that evaluation.

Evaluation Comments:

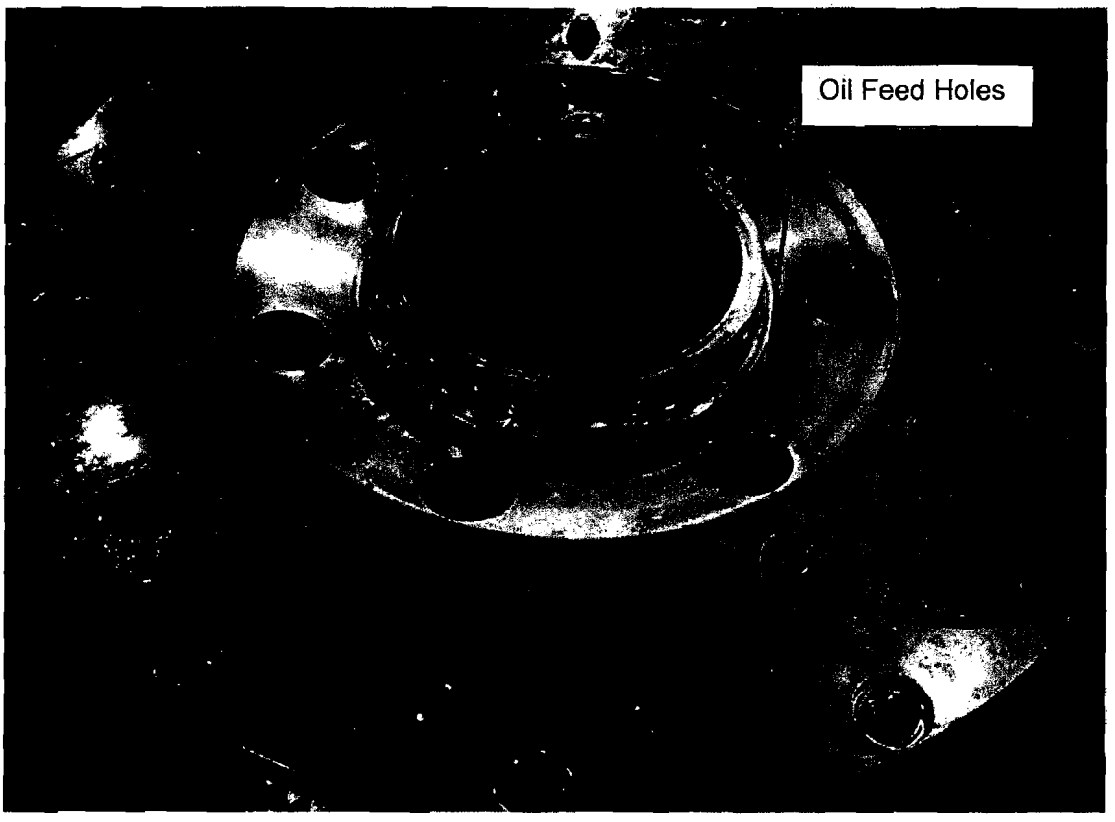
Prior to disassembly approximately 10 gallons of oil was drained from the sump thru a filter, with no chips or other significant debris detected. All chip detectors and lubrication jets were then removed and inspected for debris. No significant debris was found.

Both RH & LH Input Bevel Gear Assemblies were removed and visually inspected showing no damage or other indications of abnormal wear. Each unit rotated freely prior to and after removal. Both the LH and RH bevel pinions showed no surface distress and had acceptable contact patterns.

The torque of the T.T.O. nut, P/N 65351-11552-101, was checked in the tightening direction and measured 600 ft-lbs. The required B/P torque value is 425-475 ft-lbs.

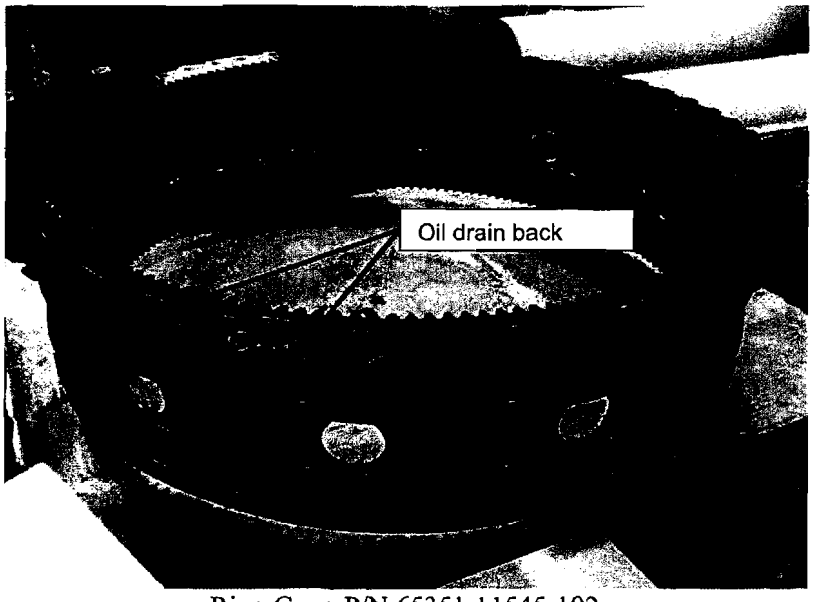
The torque of the Free Wheel Unit nut, P/N 65351-11157-101, was checked in the tightening direction and measured 800 ft-lbs. for the RH unit and 1000 ft-lbs for the LH unit. The required B/P torque value is 400-500 ft-lbs.

The Second Stage Planetary Assembly (65351-11530-044) was removed and no visible damage was found. Both sides of the Lower Planetary Plate (65351-11537-102) were inspected using Fluorescent Penetrant Inspection (FPI), paying special attention to the oil feed holes. No cracks or other abnormalities were detected during the inspection process.



Second Stage Planetary Assembly, P/N 65351-11530-044

The Ring Gear (65351-11545-102) was removed and was found to have no abnormal wear and no notable anomalies. The gear was inspected using Magnetic Particle Inspection (MPI), paying special attention to the oil drain back holes. No cracks or other abnormalities were detected.



Ring Gear, P/N 65351-11545-102

The overall assessment was that gearbox exhibited normal wear with no notable anomalies.

Sikorsky
A United Technologies Company

Sikorsky Aircraft Corporation
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P.O. Box 9729
Stratford, Connecticut 06615-9129
(203) 386-4000

January 3, 2008

LPM-H53-01-08-001

Warner Robins Air Logistics Center
226 Cochran Street
Robins AFB, GA 31098

Attention: LUHJE
Mr. Ray Goorah

Subject: H-53 Intermediate Gearbox attachment hardware recommendations

During a recent safety investigation a discrepancy was found between the operator maintenance manuals and the Sikorsky Intermediate gearbox installation drawings. The NAVAIR, USAF and IAF field manuals call for the IGB attachment nuts, P/N SS5086-05, to be torqued to 200 inch-pounds. The Sikorsky installation drawing 65350-07100 specifies a torque value of 150/145 inch-pounds. The Sikorsky installation drawing 65350-07101 specifies a torque value of 145/140 inch-pounds. The torque values were added to the drawings in the mid 1970's when the MS21042-5 nuts were replaced by SS5086-05 nuts.

It is recommended that the USAF conduct a review of the applicable field level maintenance manuals for the installation of the intermediate gearbox assembly (both 65357-07000 and 65357-07200 series). The torque value for the SS5086-05 attachment nuts shall be revised to reflect the corresponding blueprint torque value of 150/140 inch-pounds.

At the next overhaul of the intermediate gearbox assembly it is recommended to perform the following:

1) Check the center housing attachment studs for looseness per the applicable depot level maintenance manual.
2) During the fluorescent penetrant inspection of the intermediate gearbox center housing, pay special attention to the area adjacent to the attachment studs for any crack indications

Please do not hesitate to contact me with any questions at (203) 386-3798.

Very Truly Yours,

SIKORSKY AIRCRAFT CORPORATION

Mr. Joseph S. Fifer Jr.
MH-53J/M Customer Service Manager
Worldwide Customer Service
jfifer@sikorsky.com

USAGE DATA

DASH NO	MODEL	EFFECTIVITY FROM	EFFECTIVITY THRU	NEXT ASSEMBLY	QTY N/A	QTY F/A	REPLACES
-011	HH-53B	66-14	66-14335	65070-95101	1		
-012	HH-53B	NOT TO BE USED		65070-95101	1		
-011	HH-53C	NOT TO BE USED		65000-07010	1	1	
-013	HH-53C	67-14793	68-8286	65070-95101	1	1	
-013	HH-53C	68-10354	SUBS	65000-07010	1	1	
-013	HH 53B	Sr 66-14435	SUBS	65000-07010	1	1	

DISTRIBUTION C:
Distribution authorized to US Government agencies and their contractors

FURNISHED UNDER
CONTRACT: N00019-72-A-0057

DWG NO 65350-07101

DRAWING SHEET AND REVISION STATUS

SHEET NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
REV SYMBOL	J	D	D																										

REVISIONS

SYM	DESCRIPTION	APPROVED
J	REV'D STATUS OF SH. 1	mek
	2 & 3 (MINOR)	12-8-71

Sikorsky Aircraft DIVISION OF UNITED AIRCRAFT CORPORATION

U
A

DRAWING TITLE: TRANSMISSION INSTL
PYLON

SIZE	CODE IDENT NO	DRAWING NUMBER
A	78286	65350-07101

REVISION	DATE	SHEET	OF
J	7-1-66	1	3

SA 5078, REV. A

PARTS CHART

ITEM NO	PART NO	USED ON MODEL	EFFECTIVITY FROM	EFFECTIVITY THRU	REPLACED BY PART NO
~~1~~	~~65358-07000-041~~	~~HH53C~~	~~67-14993~~	~~68-8586~~	~~65358-07000-044~~
1	65358-07000-044	HH53C	68-10354	& SUBQ	NONE
2	65357-07000-043	HH53C	67-14993	68-8586	65357-07000-045
2	65357-07000-045	HH53C	68-10354	69-5797	65357-07000-048
2	65357-07000-048	HH53C	SUBQ TO 69-5797	& SUBQ	NONE

ORIG	DATE	DESIGN SUPV	DESIGN CHECKER	RECORDS CHECKER	MATERIAL	FINISH	STRUCT	MASS PROP	SPEC	TASK MANAGER	CMO	CLASS	RELEASE GROUP	GOVT	CONTRACT NO NO.
[illegible]	11-12-69	2/4/70	2/4/70		2/4/70				2/4/70				2/4/70	2/12/70	

REV SYM	SEO/RTE (PCN NO)	SWN LFTD	F/D ZONE	LM	PL COL	EFFECTIVITY	DESCRIPTION OF CHANGE
C1	EO 98014 PCN. 65-56123-55-001	X	X	X	-013	68-10354 & SUBQ	INC EO 98014

ORIG	DATE	DESIGN SUPV	DESIGN CHECKER	RECORDS CHECKER	MATERIAL	FINISH	STRUCT	MASS PROP	SPEC	TASK MANAGER	CMO	CLASS	RELEASE GROUP	GOVT	CONTRACT MOD NO
[illegible]	11-9-71	11/29/71	12/1/71	12-1-71					11-10-71				12-27	12-27	

REV SYM	SEO/RTE (PCN NO)	SWN LFTD	F/D ZONE	LM	PL COL	EFFECTIVITY	DESCRIPTION OF CHANGE
D1	EO 11008 PCN 65-51420-35-003				-013	SUBQ TO 69-5797 & SUBQ	INC EO 11008

NOTES
1. P/F ELASTIC STOP NUT CORP
2. P/F STANDARD PRESSED STEEL CO.

DISTRIBUTION B:
Distribution authorized to US Government agencies only

PARTS LIST

QTY -013	QTY	QTY -011	◆	▶	◁	◀	CODE IDENT NO	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
12		12						51535-61265-1	WASHER	.04	
[illegible]		6						51535-61262-4	SHIM	.03	
6		6						51535-61262-3	SHIM	.01	
6		6						51535-61262-2	SHIM	.01	
6		6						51535-61262-1	SHIM	.01	
1		1						65551-08003-101	BRACKET	.012	
1						2		65357-07000-048	INTERMEDIATE GEAR BOX		
1		1						65362-00022-042	PYLON SHAFT ASS'Y	[illegible]	
1						1		65358-07000-044	TAIL GEAR BOX		
1		1				1		65358-07000-041	TAIL GEAR BOX	155.55	
1						2		65357-07000-045	INTERMEDIATE GEAR BOX		
1		--				2		65357-07000-043	INTERMEDIATE GEAR BOX		
--		1						65357-07000-042	INTMED. GEAR BOX	71.5	
								65350-07101-012	TRANS INSTL PYLON	249.23	
								65350-07101-011	TRANS INSTL PYLON	249.23	

PARTS LIST

QTY	QTY	QTY -011	◆	▶	◁	◀	CODE IDENT NO	PART NUMBER	NOMENCLATURE	UNIT WT	ZONE
6		6			1		72962	EB-080	NUT	.035	
4		4			2		56878	EWB 22-8-23	BOLT	[illegible]	
10		10						MS 20002C8	WASHER	.007	
8		8						MS 21042-5	NUT	.006	
[illegible]		6						NAS 620 19	BOLT	.148	
4		4						NAS 578-8B	RETAINER	.019	
4		4						NAS 577-8A	BARREL NUT	.006	
[illegible]		6						AN122586	WASHER	.006	
7		7						AN122583	WASHER	.003	
12		12						6435-60205-101	WASHER	.03	

SYMBOLS & ABBREVIATIONS
SS – SIKORSKY STANDARD
SER – SIKORSKY ENGRG REPORT
EO – ENGINEERING ORDER
RTE – REQUEST TO ENGINEERING
◀ SEE PARTS CHART
◁ SEE NOTE NO
◆ NOT TO BE USED FOR PRODUCTION AIRCRAFT OR SPARES
▶ VENDOR ITEM – SEE SOURCE CONTROL OR SPECIFICATION CONTROL DRAWING

WEIGHT	DELESSIO	7-1-66
RECORDS CHKR	[illegible]	7-13-66
SECT SUPER	[illegible]	7-5-66
DESIGNER	[illegible]	7-5-66
DRAWN BY	DELESSIO	7-1-66
REL GROUP	[illegible]	9-29-66

RELEASED BY E.E. 6511-00-7
DATE 9-23-66 PROJ OFF 9821
GOVT APP BY
DATE

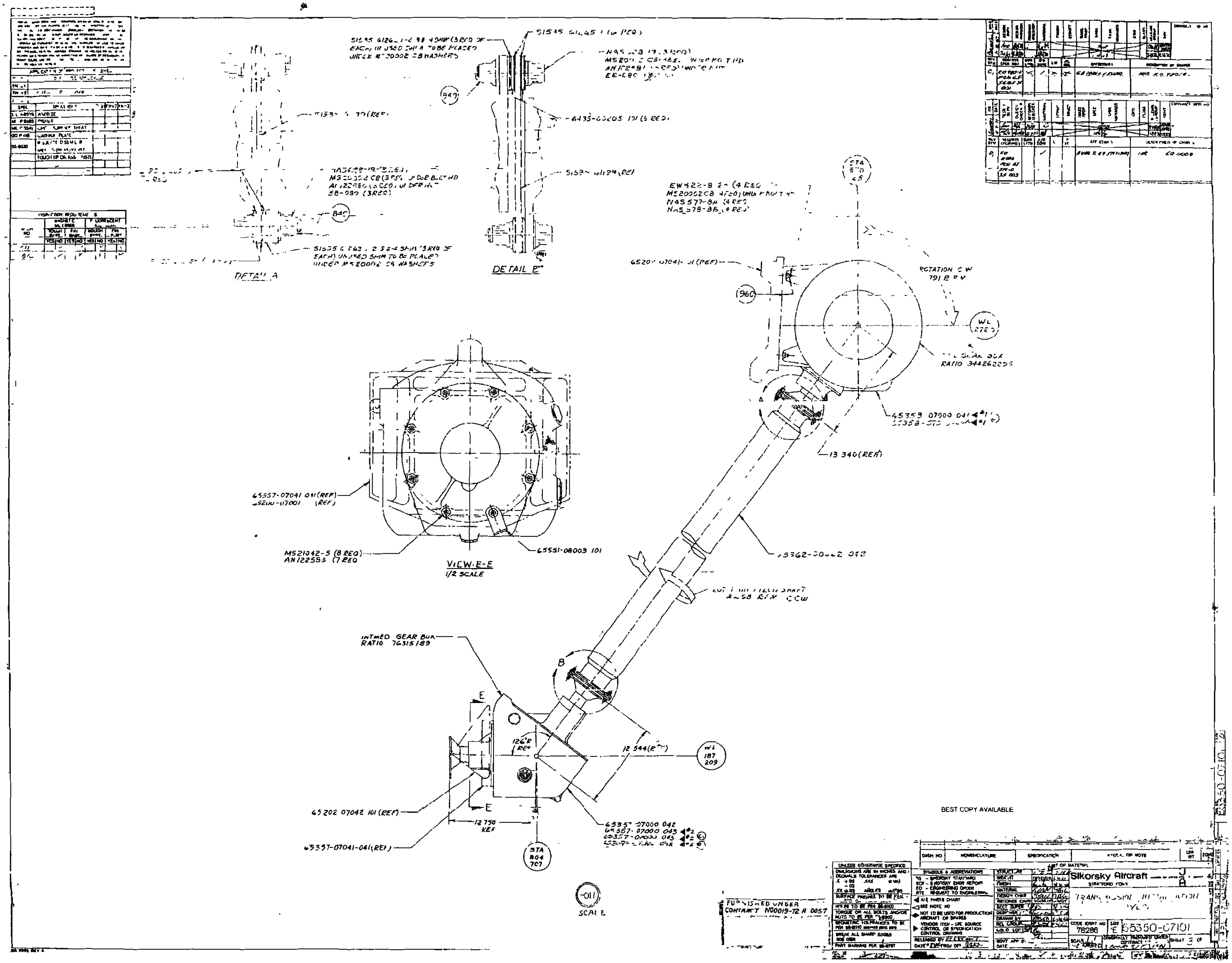
Sikorsky Aircraft, Division of United Aircraft Corporation
STRATFORD, CONN.

TRANSMISSION – INSTL PYLON

CODE IDENT NO 78286 | SIZE C | 65350-07101
SCALE NONE | ORIGINALLY PREPARED UNDER CONTRACT NO N00019-67-C-0401 | SHEET 2 OF

DWG NO 65350-07101 SYM D

SA-5083 REV A


DETAIL A
DETAIL B
VIEW E-E
1/2 SCALE
ROTATION CW
INTMED GEAR BOX
RATIO 76315189
65357-07041 011 (REF)
MS21042-5 (8 REQ)
AN122593 (7 REQ)
65551-08003 101
13 340 (REF)
12 544 (REF)
65202 07042 101 (REF)
65357-07041-041 (REF)
12 750 REF
STA 804 707
WL 187 209
SCALE
BEST COPY AVAILABLE
Sikorsky Aircraft
STRATFORD CONN
78286
65350-07101

NOT MEASUREMENT SENSITIVE

MIL-HDBK-61A(SE)

7 February 2001

SUPERSEDING
MIL-HDBK-61
30 SEPTEMBER 1997

MILITARY HANDBOOK

CONFIGURATION MANAGEMENT GUIDANCE

This handbook is for guidance only.
Do not cite this document as a requirement

AMSC N/A

AREA CMAN

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

When the urgent or emergency priority is properly used, the contractor must be authorized to proceed with implementing the change as quickly as possible. Under these circumstances, it is often necessary to utilize a unilateral change order to the contract (or contracting officer letter) to provide official authorization to proceed. If the change order is to be used, a "not-to-exceed" price quotation (a "not-less-than" price for cost reduction ECPs) would be required to set a limitation on the price impact of the change activities to be accomplished. After the change order is issued, it is important to proceed as expeditiously as possible with the normal "definitization" process to minimize the risk of related price increase (or to maximize the related savings) resulting from the change.

VECPs are subject to essentially the same CCB process as other ECPs. Under the FAR clause, the Government is entitled to reimbursement of expenses incurred in processing an approved VECP before any cost savings are shared out to the contractor. Therefore, the tasking activity must develop auditable government cost information so that the complete monetary impact of the VECP can be evaluated. Any delays in VECP processing will typically reduce the savings benefit.

b. **Dispositioning Class II ECPs.** Unless otherwise specified by contract (e.g., as part of the Single Process Initiative), the government administrative contracting officer or plant representative serves as the dispositioning authority for Class II ECPs.. The default action required on Class II changes is concurrence/non-concurrence in classification only, unless the contract requires approval/disapproval. Government concurrence in Class II ECP classification normally allows the contractor to incorporate the change in the applicable CI and update its configuration documentation without any further government action or authorization being required. A non-concurrence in classification will normally result in the Class II ECP being canceled or reclassified to a Class I ECP.

The government should require approval/disapproval of class II ECPS only when the Government is the CDCA for the original drawings, or data files, and compliance with the specific detailed design is a requirement of the contract. If there is a government ACO or plant representative available, the Government tasking activity may elect to have the ACO or representative review the proposed class II changes for concurrence in classification before they are submitted to the government tasking/procuring activity (that is the CDCA) for approval **[Details: Activity Guide: Table 6-7]**

6.2.1.5 **Implementing Class I ECPs.** When ECPs are approved, change implementation to a CI being produced under contract is usually a straightforward contractual incorporation of the ECP as approved by the government CCB. CCB approval action is not to be considered authority for the contractor or tasking activity to proceed with the change.

- A CCB directive must be prepared, published and distributed. The CCB directive is identified by the CCB identifier and the change identifier. The date of the CCB directive and disposition are recorded. Distribution should be limited to those parties required to take action to implement the change
- If implementation of the approved change is the responsibility of the contractor under the terms of a contract, the CCB approval action directs the procurement contracting officer to initiate instructions to the contractor
- If Contractor-initiated change proposals are involved, the receipt of a formal contract change for example, Standard Form 30, "Amendment of Solicitation/Modification of contract" or PCO letter (pending receipt of an amendment) shall constitute sole authority for the contractor to proceed.
- If the initiator is government activity acting in the capacity of a contractor, the receipt of the directive/order (including funding authorizations) shall constitute sole authority to proceed with the change.

Change implementation to a CI in the inventory or operational forces will normally require the coordination of additional requirements of an implementing CCB directive (or tasking order).

- Necessary instructions and funding authorizations must be issued for the scheduled implementation of the change
- Change accomplishment reporting is directed. **[Details: Activity Guide: Table 6-8]**

The incorporation of approved changes should be planned so that optimum acquisition, production, tests, evaluation and operational advantages can be derived from the modified configuration. The change is effectively coordinated to

MEMBER: 1
FILE NUMBER :: 6
ADD FILE NUMBER :: 6
ACCESSION NUMBER :: 772298
DATE OF LAST EDIT :: 2008-01-23
SUBJECT :: Generator assy requires functionality check for
proper operation at the request of the SIB
investigation
DATE INPUT TO INFOCEN :: 2007-10-01
ORIGINATOR ADDRESS :: HQ AFSOC/A4MYH
ORIGINATOR INSTALLATION :: Hurlburt Field AFB, Fl., 32544
ORIG NAME/PHONE NR/DT SUB :: TSgt Andrew D. Jones, Com 850-884-7659, DSN
579-7659
AF CRITICAL ITEM (Y/N) :: N
ORIGINATING POINT :: 1 SOMOS/MQP
ORG PT NAME/PHONE NR/DT VER:: TSgt Kenneth Dockery, Com 850-884-7571, DSN
579-7571
Orig Pt Office Email Addr :: 1somxg.dr@hurlburt.af.mil
REPORT CATEGORY (1 OR 2) :: 1
CATEGORY PRIORITY :: 1A
OPERATIONAL IMPACT :: CRASH INVESTIGATION
QA1 OR QAKA/QAKE REPORT :: QA1
REPORT CONTROL NUMBER :: FB4417070365
MISHAP/HAP CONTROL NUMBER :: 110524
MISHAP CLASS :: A
NATIONAL STOCK NUMBER :: 6115-00-292-4779 BZ
NOMENCLATURE :: GENERATOR,ALTERNATI
DATE DEFICIENCY DISCOVERED :: 2007-09-07
MANUFACTURER SOURCE :: HONEYWELL INTERNATIONAL INC
OVERHAUL/REPAIR SOURCE :: WRALC
MANUFACTURER (CAGE) CODE :: 64547
OHAUL/REPAIR SRC CAGE CODE :: UNK
MAINTENANCE TYPE :: C
MANUFACTURERS PART NUMBER :: 28B58-57A
REQUISITION NUMBER :: FB4417
ITEM NEW OR REPAIRED :: R
END ITEM MDS :: MH053
END ITEM SERIAL NUMBER :: 69-5794
UNIT COST :: 18092
ITEM UNDER WARRANTY (Y/N/U):: N
DETAILS/PROBLEM SUMMARY :: Circumstances Prior to Difficulty:
Component requires evaluation for functionality per the request of the SIB investigators
Requested exhibit analysis:
Analyze/investigate
root cause.
Requested PQDR Exhibit Action: Repair
MAJCOM/ACTIVITY CODE :: 0V
COUNTRY :: USA
SOURCE OF SUPPLY :: FLZ
EXBT SUB HOLDING STATUS :: A30

HOLDING ACTIVITY ADDRESS :: AFSOC SIB/afsoc.sib2@hurlburt.af.mil
SAFETY OFFICER/PHONE NO :: Maj David Nicholson, Com 850-884-2081, DSN
579-2081
SAFETY OFFICER EMAIL :: david.nicholson@hurlburt.af.mil
QA/EQUIP SPECIALIST/PHON NO:: MARK KUTAY, DSN 497-6953
QA/EQUIP SPEC/EMAIL ADDRESS:: mark.kutay@robins.af.mil
QA/EQUIP SPEC OFFICE SYMBOL:: 573 ACSS/GFLCC
QA/EQUIP SPECIALIST CODE :: H
DR/MIP STATUS :: OPEN
MIP PRIORITY :: U
TYPE DEFICIENCY :: MDR
SUBMITTED DR TYPE :: PQDR
LAST UPDATE :: 2008-01-23
NEXT UPDATE DUE :: 2008-03-23
EXBT RQRD/RQSTD/HOLD Y/N/H :: Y
DTE EXBT INSTRUCTS PROVIDED:: 2007-10-16
EXBT SHIP-TO ADDR/INSTRUCTS:: (2007-10-16) N3096A, Fleet Readiness Center
Southwest Customer Service, Bld. 341 San Diego,
CA 92135 Attn. S. Manganelli
PROJ ENGINEER/PHONE/OFFICE :: JIM SAWINSKI, DSN 497-6950, JAMES.SAWINSKI
ROBINS.AF.MIL
DATE RECEIVED AT SPOCO :: 2007-10-02
TREND ANALYSIS INDICATOR :: Total=4 Open=2 Closed=2 Last6=2 Last12=2 Last24=2 MDS=2 MH053;1 MH053J;1 MH053M;; RO21=12 CAT1=2
Originator Email Address :: andrew.jones@hurlburt.af.mil
Originator ID :: kenneth.dockery@hurlburt.af.mil
MANUFACTURER ANALYSIS INDIC:: Total=220 Open=12 Closed=208 Last6=15 Last12=26
Last24=67 RO21=309 CAT1=13
OVERHAULER ANALYSIS INDIC :: Total=323 Open=51 Closed=272 Last6=120 Last12=172 Last24=230 RO21=114 CAT1=16
ACTION SUMMARY ::

(2008-01-23) Per Engineer Steve Manganelli at North Island: Subject generators were functionally tested on 17 Jan 08 to salient acceptance criteria listed in NAVAIR Manual 03-5AS-31, that normally applied to post-overhauled units at FRC-SW. Tests included no-load excitation current and voltage balance, PMG no-load voltage, PMG full load voltage, output full load excitation current and output voltage balance, 150% load, and overspeed (non-excited). Both generators were run simultaneously on a "feedback" test stand, each as UUT and slave. Both generators performed within acceptance limits. Prior to run, the cooling air "hats" were removed for FOD inspection with none noted.
(2007-11-09) Request for TCN submitted 6 Nov 07; awaiting that info from AFSOC
to track property. No 'Q' assets are showing in Legacy systems for identified
NSN.
(2007-10-16) Shipping instructions received from North Island; i660 has been
updated.

(2007-10-11) Report was transferred to North Island in error. Per telecon with
FSC at Cherry Point, this report will be closed administratively in NAMDRP.
Item should be investigated by Air Force engineering team since it is related
to a mishap. If items are slated for repair at a later date, NAVAIR will get
involved at that time.
(2007-10-05) Report will be transferred to North Island for investigation and
resolution. North Island POC will also be contacted by email to ensure that
disposition instructions are received in a timely fashion.
(2007-10-02) Assigned to ES Mark Kutay, with engineering support provided by Jim Sawinski.

--- Critical/Major/Minor Defects ----

Location Assigned	Order	MDS	Tail #	Scheduled to Retire Date/Timeline	Additional Notes
Hurlburt Field	18	MH-53M	73-1649	Retire no later then Oct 08	Selected for PEMA museum input
Hurlburt Field	17	MH-53M	68-10924	Retire no later then Oct 08	
Hurlburt Field	16	MH-53M	73-1652	Retire no later then Oct 08	
Hurlburt Field	15	MH-53M	70-1631	Retire no later then Oct 08	
Hurlburt Field	14	MH-53M	68-10369	Retire no later then Oct 08	Selected for Hill AFB museum input
Hurlburt Field	13	MH-53M	73-1648	Retire no later then Oct 08	
Hurlburt Field	12	MH-53M	68-10357	March/April timeframe	Selected for Wright Pat AFB museum input
Hurlburt Field	11	MH-53M	69-5785	Retire no later then Oct 08	
Hurlburt Field	10	MH-53M	70-1626	Retire no later then Oct 08	Selected for WR-ALC museum input
Hurlburt Field	9	MH-53M	70-1629	Retire no later then Oct 08	
Hurlburt Field	8	MH-53M	68-8284	Retire no later then Oct 08	Added as a BAI aircraft
Hurlburt Field	7	MH-53M	69-5790	Retire no later then Oct 08	Added as a BAI aircraft
Hurlburt Field	6	MH-53M	67-14995	Retire no later then Oct 08	To retire pending SIB/AIB findings
Mildenhall	5	MH-53M	67-14994	Retires no later then Oct 08	Transferred to HFLD from RAFM
					HFLD airpark input
Hurlburt Field	4	MH-53M	69-5794	Retire no later then Oct 07	To Retire Pending SIB/AIB Disposition
					Working RAF Costford Museum Input with
					Selected as Kirtland AFB airpark input

Retires 08	Items of Interest
Retires 07	Strikethrough equals retired

Updated 28 Jan 08

Anthony, Frizi S TSgt MIL USAF AFSOC/CCX

From: Halvorson, David L MSgt MIL USAF 1SOHMXS/MXAG [David.Halvorson@hurlburt.af.mil]
Sent: Sunday, October 28, 2007 4:29 PM
To: Stohler, Michael S Maj MIL USAF AFSOC/A8PP; Whitfield, Bernabe F Capt MIL USAF 1SOHMXS/MXA
Subject: RE: 5794 AMARC

Sir,

It was suppose to depart with 356 and 358 which went out on 2 Oct for induction on 5 Oct.

V/r
MSgt Halvorson

-----Original Message-----
From: Stohler, Michael S Maj MIL USAF AFSOC/A8PP
Sent: Sunday, October 28, 2007 4:19 PM
To: Whitfield, Bernabe F Capt MIL USAF 1SOHMXS/MXA
Cc: Halvorson, David L MSgt MIL USAF 1SOHMXS/MXAG
Subject: 5794 AMARC

Bernie, what was 5794's exact input date to AMARC?

Thanks,

Maj. Stohler

TAB AA

FLIGHT DOCUMENTS

	TIME	WOW 1=TRUE	Lat_System degrees	Long_System degrees	Groundtrack_System degrees	Groundspeed_System knots	Altitude_System feet above MSL	THDG_Sys degrees
5:13:21	03:07:30	0	30.42333333	-86.685	357	0	48	
5:13:25	03:07:34	0	30.42333333	-86.685	359	0	48	
5:13:31	03:07:40	0	30.42333333	-86.685	0	0	48	
5:13:35	03:07:44	0	30.42333333	-86.685	1	0	56	
5:13:41	03:07:50	0	30.42333333	-86.685	0	0	56	
5:13:45	03:07:54	0	30.42333333	-86.685	0	0	56	
5:13:51	03:08:00	0	30.42333333	-86.685	0	0	56	
5:13:56	03:08:05	0	30.42333333	-86.685	1	0	56	
5:14:01	03:08:10	0	30.42333333	-86.685	2	0	60	
5:14:05	03:08:14	0	30.42333333	-86.685	1	0	64	
5:14:11	03:08:20	0	30.42333333	-86.685	359	0	60	
5:14:16	03:08:25	0	30.42333333	-86.685	0	0	60	
5:14:21	03:08:30	0	30.42333333	-86.685	0	0	56	
5:14:26	03:08:35	0	30.42333333	-86.685	0	0	60	
5:14:31	03:08:40	0	30.42333333	-86.685	358	0	52	
				0				
5:15:48	03:09:57	0	30.42316667	-86.6845	359	1	48	
5:15:53	03:10:02	0	30.42333333	-86.6845	358	18	56	
5:15:58	03:10:07	0	30.424	-86.68466667	356	37	76	
5:16:03	03:10:12	0	30.42516667	-86.68466667	352	50	112	
5:16:08	03:10:17	0	30.42633333	-86.68483333	354	62	168	
5:16:13	03:10:22	0	30.428	-86.685	357	74	224	
5:16:18	03:10:27	0	30.42983333	-86.68516667	359	85	276	
5:16:23	03:10:32	0	30.43183333	-86.68516667	359	95	324	
5:16:28	03:10:37	0	30.43416667	-86.68516667	358	101	392	
5:16:33	03:10:42	0	30.4365	-86.68533333	357	105	468	
5:16:38	03:10:47	0	30.439	-86.6855	356	108	548	
5:16:43	03:10:52	0	30.4415	-86.686	344	109	632	
5:16:48	03:10:57	0	30.44383333	-86.68716667	329	108	740	
5:16:53	03:11:02	0	30.44583333	-86.689	309	106	840	
5:16:58	03:11:07	0	30.447	-86.69133333	287	104	940	
5:17:03	03:11:12	0	30.44716667	-86.69416667	262	101	1020	
5:17:08	03:11:17	0	30.44633333	-86.69666667	237	100	1064	
5:17:13	03:11:22	0	30.44483333	-86.6985	215	102	1068	
5:17:18	03:11:27	0	30.44266667	-86.69983333	197	106	1072	
5:17:23	03:11:32	0	30.44016667	-86.70033333	185	112	1036	
5:17:28	03:11:37	0	30.4375	-86.70033333	178	116	1000	
5:17:33	03:11:42	0	30.43483333	-86.70016667	176	118	976	
5:17:38	03:11:47	0	30.432	-86.7	175	118	976	
5:17:43	03:11:52	0	30.42933333	-86.69966667	176	117	984	
5:17:48	03:11:57	0	30.4265	-86.6985	177	117	996	
5:17:53	03:12:02	0	30.42383333	-86.69933333	178	118	984	
5:17:58	03:12:07	0	30.42116667	-86.69933333	180	117	980	
5:18:03	03:12:12	0	30.41833333	-86.69933333	181	117	980	
5:18:08	03:12:17	0	30.41566667	-86.69933333	183	116	976	
5:18:13	03:12:22	0	30.413	-86.69966667	186	116	976	
5:18:18	03:12:27	0	30.41033333	-86.7	188	116	972	
5:18:23	03:12:32	0	30.40766667	-86.7005	191	116	960	
5:18:28	03:12:37	0	30.405	-86.70133333	196	116	936	
5:18:33	03:12:42	0	30.4025	-86.7025	206	118	920	
5:18:38	03:12:47	0	30.4	-86.704	216	117	920	
5:18:43	03:12:52	0	30.398	-86.70616667	226	115	928	
5:18:48	03:12:57	0	30.39633333	-86.7085	237	112	964	
5:18:53	03:13:02	0	30.39516667	-86.71116667	249	110	992	
5:18:58	03:13:07	0	30.3945	-86.714	260	110	1020	
5:19:03	03:13:12	0	30.39416667	-86.717	260	112	1024	
5:19:08	03:13:17	0	30.39366667	-86.72	259	114	1008	
5:19:13	03:13:22	0	30.39316667	-86.723	259	116	984	
5:19:18	03:13:27	0	30.39266667	-86.726	259	117	968	
5:19:23	03:13:32	0	30.39216667	-86.72916667	259	117	960	
5:19:28	03:13:37	0	30.39166667	-86.73233333	259	117	956	
5:19:33	03:13:42	0	30.39116667	-86.73533333	260	117	960	
5:19:38	03:13:47	0	30.39066667	-86.7385	260	116	956	
5:19:43	03:13:52	0	30.39016667	-86.7415	261	115	952	

5:19:48	03:13:57	0	30.38983333	-86.7445	262	115	956
5:19:53	03:14:02	0	30.3895	-86.7475	262	113	960
5:19:58	03:14:07	0	30.38916667	-86.7505	263	111	968
5:20:03	03:14:12	0	30.38883333	-86.7535	264	108	976
5:20:08	03:14:17	0	30.38866667	-86.75633333	266	107	980
5:20:13	03:14:22	0	30.3885	-86.75933333	266	109	956
5:20:18	03:14:27	0	30.38833333	-86.76216667	265	111	928
5:20:23	03:14:32	0	30.388	-86.76516667	264	113	900
5:20:28	03:14:37	0	30.38766667	-86.76833333	264	113	872
5:20:33	03:14:42	0	30.3875	-86.77133333	264	114	852
5:20:38	03:14:47	0	30.38716667	-86.77433333	263	114	832
5:20:43	03:14:52	0	30.38683333	-86.77733333	263	114	820
5:20:48	03:14:57	0	30.3865	-86.7805	265	114	812
5:20:53	03:15:02	0	30.38633333	-86.7835	265	113	804
5:20:58	03:15:07	0	30.38616667	-86.7865	266	112	804
5:21:03	03:15:12	0	30.386	-86.7895	266	109	812
5:21:08	03:15:17	0	30.38583333	-86.79233333	267	107	828
5:21:13	03:15:22	0	30.38566667	-86.79516667	267	106	836
5:21:18	03:15:27	0	30.3855	-86.798	264	106	836
5:21:23	03:15:32	0	30.38516667	-86.80083333	263	107	840
5:21:28	03:15:37	0	30.38483333	-86.80383333	262	107	852
5:21:33	03:15:42	0	30.3845	-86.80666667	262	107	860
5:21:38	03:15:47	0	30.38416667	-86.8095	263	107	872
5:21:43	03:15:52	0	30.38383333	-86.81233333	264	106	868
5:21:48	03:15:57	0	30.38366667	-86.81516667	264	106	872
5:21:53	03:16:02	0	30.38333333	-86.818	265	105	880
5:21:58	03:16:07	0	30.38316667	-86.82083333	265	104	888
5:22:03	03:16:12	0	30.38283333	-86.8235	264	105	892
5:22:08	03:16:17	0	30.38266667	-86.82633333	264	106	888
5:22:13	03:16:22	0	30.38233333	-86.82916667	265	106	876
5:22:18	03:16:27	0	30.38216667	-86.832	266	106	860
5:22:23	03:16:32	0	30.38216667	-86.83483333	282	102	852
5:22:28	03:16:37	0	30.38333333	-86.83716667	317	102	832
5:22:33	03:16:42	0	30.3855	-86.83833333	357	105	788
5:22:38	03:16:47	0	30.38783333	-86.83766667	33	105	772
5:22:43	03:16:52	0	30.3895	-86.83566667	55	106	780
5:22:48	03:16:57	0	30.39066667	-86.83316667	69	108	804
5:22:53	03:17:02	0	30.39116667	-86.83033333	88	108	836
5:22:58	03:17:07	0	30.39083333	-86.8275	110	105	892
5:23:03	03:17:12	0	30.38983333	-86.82483333	119	106	960
5:23:08	03:17:17	0	30.38866667	-86.82233333	119	107	1032
5:23:13	03:17:22	0	30.3875	-86.81983333	118	108	1100
5:23:18	03:17:27	0	30.38633333	-86.81716667	116	109	1144
5:23:23	03:17:32	0	30.38516667	-86.8145	111	111	1188
5:23:28	03:17:37	0	30.3845	-86.81166667	100	112	1236
5:23:33	03:17:42	0	30.38433333	-86.80866667	91	114	1268
5:23:38	03:17:47	0	30.38433333	-86.80566667	88	114	1308
5:23:43	03:17:52	0	30.38433333	-86.8025	96	113	1348
5:23:48	03:17:57	0	30.384	-86.7995	94	113	1388
5:23:53	03:18:02	0	30.384	-86.7965	87	112	1380
5:23:58	03:18:07	0	30.38416667	-86.7935	84	112	1365
5:24:03	03:18:12	0	30.3845	-86.7905	84	111	1356
5:24:08	03:18:17	0	30.38483333	-86.7875	82	111	1340
5:24:13	03:18:22	0	30.38516667	-86.78466667	82	111	1316
5:24:18	03:18:27	0	30.3855	-86.78166667	82	111	1300
5:24:23	03:18:32	0	30.38583333	-86.77866667	81	110	1292
5:24:28	03:18:37	0	30.38633333	-86.77583333	82	109	1284
5:24:33	03:18:42	0	30.38666667	-86.77283333	81	109	1276
5:24:38	03:18:47	0	30.387	-86.77	81	108	1256
5:24:43	03:18:52	0	30.3875	-86.76716667	80	107	1240
5:24:48	03:18:57	0	30.38783333	-86.76433333	80	105	1228
5:24:53	03:19:02	0	30.38833333	-86.76166667	81	104	1204
5:24:58	03:19:07	0	30.38866667	-86.75883333	80	103	1172
5:25:03	03:19:12	0	30.38916667	-86.75616667	80	102	1144
5:25:08	03:19:17	0	30.3895	-86.7535	81	101	1120
5:25:13	03:19:22	0	30.38983333	-86.75083333	83	100	1096

5:25:18	03:19:27	0	30.39	-86.74816667	85	100	1064
5:25:23	03:19:32	0	30.39016667	-86.7455	85	100	1028
5:25:28	03:19:37	0	30.3905	-86.74266667	84	100	1000
5:25:33	03:19:42	0	30.39066667	-86.74	84	99	976
5:25:38	03:19:47	0	30.391	-86.7375	84	98	952
5:25:43	03:19:52	0	30.39116667	-86.73483333	84	97	932
5:25:48	03:19:57	0	30.3915	-86.73216667	84	97	912
5:25:53	03:20:02	0	30.39166667	-86.72966667	84	96	892
5:25:58	03:20:07	0	30.39183333	-86.72716667	84	95	884
5:26:03	03:20:12	0	30.39216667	-86.7245	84	94	864
5:26:08	03:20:17	0	30.39233333	-86.722	85	93	844
5:26:13	03:20:22	0	30.3925	-86.7195	85	92	820
5:26:18	03:20:27	0	30.39266667	-86.71716667	85	92	812
5:26:23	03:20:32	0	30.39283333	-86.71466667	84	91	808
5:26:28	03:20:37	0	30.39316667	-86.71233333	83	90	812
5:26:33	03:20:42	0	30.39333333	-86.70983333	83	90	816
5:26:38	03:20:47	0	30.39366667	-86.7075	82	90	828
5:26:43	03:20:52	0	30.394	-86.705	81	90	832
5:26:48	03:20:57	0	30.39433333	-86.70266667	80	91	836
5:26:53	03:21:02	0	30.39466667	-86.70016667	79	91	832
5:26:58	03:21:07	0	30.39516667	-86.69783333	78	91	832
5:27:03	03:21:12	0	30.3955	-86.6955	77	91	824
5:27:08	03:21:17	0	30.39616667	-86.69316667	72	93	780
5:27:13	03:21:22	0	30.397	-86.69083333	61	95	692
5:27:18	03:21:27	0	30.39816667	-86.68866667	49	97	608
5:27:23	03:21:32	0	30.39983333	-86.68683333	40	98	536
5:27:28	03:21:37	0	30.40166667	-86.68533333	28	98	476
5:27:33	03:21:42	0	30.40383333	-86.68433333	15	96	432
5:27:38	03:21:47	0	30.406	-86.68383333	7	94	392
5:27:43	03:21:52	0	30.40816667	-86.68366667	4	92	364
5:27:48	03:21:57	0	30.41016667	-86.6835	2	85	344
5:27:53	03:22:02	0	30.41216667	-86.6835	358	78	320
5:27:58	03:22:07	0	30.41383333	-86.68366667	358	70	292
5:28:03	03:22:12	0	30.4155	-86.68366667	358	63	264
5:28:08	03:22:17	0	30.41683333	-86.68383333	355	58	240
5:28:13	03:22:22	0	30.41816667	-86.68383333	356	51	220
5:28:18	03:22:27	0	30.41916667	-86.684	358	41	200
5:28:23	03:22:32	0	30.42	-86.684	352	33	180
5:28:28	03:22:37	0	30.42083333	-86.68416667	355	27	156
5:28:33	03:22:42	0	30.42133333	-86.68416667	353	21	132
5:28:38	03:22:47	0	30.42183333	-86.68416667	357	19	116
5:28:43	03:22:52	0	30.42216667	-86.68433333	353	16	108
5:28:48	03:22:57	0	30.42266667	-86.68433333	356	13	92
5:28:53	03:23:02	0	30.42283333	-86.68433333	356	8	92
5:28:58	03:23:07	0	30.423	-86.68433333	358	6	72
5:29:03	03:23:12	0	30.42316667	-86.6845	356	3	56
5:29:08	03:23:17	0	30.42316667	-86.6845	357	2	44
				0			
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5:30:10	03:24:19	0	30.42333333	-86.6845	351	10	64
5:30:15	03:24:24	0	30.42366667	-86.6845	356	25	72
5:30:20	03:24:29	0	30.4245	-86.6845	358	40	92
5:30:25	03:24:34	0	30.4255	-86.68466667	352	56	120
5:30:30	03:24:39	0	30.427	-86.685	348	72	144
5:30:35	03:24:44	0	30.42883333	-86.68533333	351	83	164
5:30:40	03:24:49	0	30.43083333	-86.68566667	354	92	192
5:30:45	03:24:54	0	30.433	-86.68583333	0	96	240
5:30:50	03:24:59	0	30.43516667	-86.6855	18	92	316
5:30:55	03:25:04	0	30.437	-86.68433333	44	89	380
5:31:00	03:25:09	0	30.43816667	-86.68233333	77	87	416
5:31:05	03:25:14	0	30.438	-86.68	112	89	428
5:31:10	03:25:19	0	30.43666667	-86.6785	140	91	448
5:31:15	03:25:24	0	30.435	-86.67716667	154	93	496
5:31:20	03:25:29	0	30.43283333	-86.67616667	164	96	556
5:31:25	03:25:34	0	30.43066667	-86.67566667	173	98	608
5:31:30	03:25:39	0	30.42833333	-86.6755	179	101	644

5:31:35	03:25:44	0	30.426	-86.6755	180	104	672	
5:31:40	03:25:49	0	30.4235	-86.67566667	180	108	696	
5:31:45	03:25:54	0	30.42083333	-86.67566667	181	113	704	
5:31:50	03:25:59	0	30.41816667	-86.67566667	181	116	704	
5:31:55	03:26:04	0	30.4155	-86.67583333	180	119	700	
5:32:00	03:26:09	0	30.41266667	-86.67583333	180	120	696	
5:32:05	03:26:14	0	30.40983333	-86.67583333	182	120	688	
5:32:10	03:26:19	0	30.40716667	-86.67516667	195	116	620	
5:32:15	03:26:24	0	30.40483333	-86.6775	219	108	572	
5:32:20	03:26:29	0	30.40333333	-86.67966667	232	100	520	
5:32:25	03:26:34	0	30.4035	-86.68233333	298	92	468	
5:32:30	03:26:39	0	30.405	-86.68383333	341	88	406	
5:32:35	03:26:44	0	30.40716667	-86.684	5	89	384	
5:32:40	03:26:49	0	30.40916667	-86.68383333	358	90	398	
5:32:45	03:26:54	0	30.41116667	-86.684	354	87	384	
5:32:50	03:26:59	0	30.41316667	-86.68416667	357	82	388	
5:32:55	03:27:04	0	30.415	-86.68433333	356	70	376	
5:33:00	03:27:09	0	30.4165	-86.68433333	356	59	340	
5:33:05	03:27:14	0	30.41783333	-86.6845	357	50	296	
5:33:10	03:27:19	0	30.41883333	-86.68466667	356	44	252	
5:33:15	03:27:24	0	30.41983333	-86.68466667	354	39	208	
5:33:20	03:27:29	0	30.42066667	-86.68483333	358	33	172	
5:33:25	03:27:34	0	30.4215	-86.68483333	357	29	144	—
5:33:30	03:27:39	0	30.422	-86.68483333	352	25	120	-
5:33:35	03:27:44	0	30.42266667	-86.685	355	18	100	—
5:33:40	03:27:49	0	30.42283333	-86.685	355	11	68	
5:33:45	03:27:54	0	30.42316667	-86.685	353	6	84	—
5:33:50	03:27:59	0	30.42333333	-86.685	352	5	68	
5:33:55	03:28:04	0	30.42333333	-86.685	350	3	48	
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5:35:30	03:29:39	0	30.42333333	-86.685	358	1	52	
5:35:35	03:29:44	0	30.42333333	-86.685	356	3	60	
5:35:40	03:29:49	0	30.42316667	-86.685	358	4	68	
5:35:45	03:29:54	0	30.42316667	-86.685	356	1	72	
5:35:50	03:29:59	0	30.42316667	-86.685	353	1	64	
5:35:55	03:30:04	0	30.42316667	-86.685	352	1	60	
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5:36:05	03:30:14	0	30.42316667	-86.685	351	0	56	
5:36:10	03:30:19	0	30.42316667	-86.685	355	0	56	
5:36:15	03:30:24	0	30.42316667	-86.685	355	0	60	
5:36:20	03:30:29	0	30.42316667	-86.685	355	2	60	
5:36:25	03:30:34	0	30.42333333	-86.685	352	8	64	
5:36:30	03:30:39	0	30.42366667	-86.685	0	17	68	
5:36:35	03:30:44	0	30.42416667	-86.685	358	24	68	
5:36:40	03:30:49	0	30.42483333	-86.685	357	38	84	
5:36:45	03:30:54	0	30.42583333	-86.685	359	51	96	
5:36:50	03:30:59	0	30.42716667	-86.68516667	359	58	140	
5:36:55	03:31:04	0	30.42866667	-86.68516667	358	71	164	
5:37:00	03:31:09	0	30.4305	-86.68516667	357	85	152	
5:37:05	03:31:14	0	30.4325	-86.68533333	356	94	160	
5:37:10	03:31:19	0	30.43483333	-86.6855	3	98	212	
5:37:15	03:31:24	0	30.437	-86.685	21	100	304	
5:37:20	03:31:29	0	30.439	-86.6835	44	101	396	
5:37:25	03:31:34	0	30.44033333	-86.68133333	70	101	480	
5:37:30	03:31:39	0	30.44066667	-86.6785	94	104	532	
5:37:35	03:31:44	0	30.44	-86.67583333	121	107	560	
5:37:40	03:31:49	0	30.43816667	-86.67383333	150	109	592	
5:37:45	03:31:54	0	30.43583333	-86.67283333	172	112	620	
5:37:50	03:31:59	0	30.43316667	-86.67283333	181	115	632	
5:37:55	03:32:04	0	30.43033333	-86.673	183	118	648	
5:38:00	03:32:09	0	30.42766667	-86.67316667	183	120	664	
5:38:05	03:32:14	0	30.42483333	-86.67316667	183	119	704	
5:38:10	03:32:19	0	30.422	-86.67333333	183	118	736	
5:38:15	03:32:24	0	30.41933333	-86.6735	182	118	752	
5:38:20	03:32:29	0	30.4165	-86.67366667	182	118	756	

5:38:25	03:32:34	0	30.41383333	-86.67383333	182	118	764
5:38:30	03:32:39	0	30.41116667	-86.67383333	181	117	764
5:38:35	03:32:44	0	30.40833333	-86.67383333	181	115	772
5:38:40	03:32:49	0	30.40566667	-86.67383333	180	114	768
5:38:45	03:32:54	0	30.403	-86.67383333	179	113	744
5:38:50	03:32:59	0	30.4005	-86.67383333	180	112	724
5:38:55	03:33:04	0	30.39783333	-86.674	188	111	680
5:39:00	03:33:09	0	30.39533333	-86.67466667	204	107	644
5:39:05	03:33:14	0	30.39333333	-86.67633333	225	102	628
5:39:10	03:33:19	0	30.39216667	-86.6785	250	100	596
5:39:15	03:33:24	0	30.392	-86.68116667	283	101	564
5:39:20	03:33:29	0	30.39316667	-86.6835	324	100	524
5:39:25	03:33:34	0	30.39533333	-86.68416667	0	100	476
5:39:30	03:33:39	0	30.39766667	-86.684	7	95	508
5:39:35	03:33:44	0	30.39983333	-86.68383333	3	91	548
5:39:40	03:33:49	0	30.40183333	-86.68366667	1	88	544
5:39:45	03:33:54	0	30.40383333	-86.68366667	1	82	532
5:39:50	03:33:59	0	30.40566667	-86.68366667	0	75	516
5:39:55	03:34:04	0	30.40733333	-86.68366667	358	66	492
5:40:00	03:34:09	0	30.40883333	-86.68383333	359	58	460
5:40:05	03:34:14	0	30.41016667	-86.68383333	359	52	484
5:40:10	03:34:19	0	30.41133333	-86.68383333	0	52	496
5:40:15	03:34:24	0	30.4125	-86.68383333	358	52	508
5:40:20	03:34:29	0	30.41366667	-86.684	354	53	524
5:40:25	03:34:34	0	30.415	-86.684	352	52	552
5:40:30	03:34:39	0	30.41616667	-86.68433333	354	50	556
5:40:35	03:34:44	0	30.41733333	-86.68433333	357	48	560
5:40:40	03:34:49	0	30.41833333	-86.6845	0	46	552
5:40:45	03:34:54	0	30.41933333	-86.6845	0	40	536
5:40:50	03:34:59	0	30.42016667	-86.68433333	2	32	464
5:40:55	03:35:04	0	30.42083333	-86.68433333	0	23	392
5:41:00	03:35:09	0	30.42133333	-86.68433333	359	19	328
5:41:05	03:35:14	0	30.42183333	-86.6845	351	17	252
5:41:10	03:35:19	0	30.42216667	-86.6845	349	15	196
5:41:15	03:35:24	0	30.4225	-86.68466667	350	13	160
5:41:20	03:35:29	0	30.42266667	-86.68483333	351	10	136
5:41:25	03:35:34	0	30.423	-86.685	352	8	108
5:41:30	03:35:39	0	30.42316667	-86.685	352	6	92
5:41:35	03:35:44	0	30.42316667	-86.685	352	4	64
				0			
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5:43:25	03:37:34	0	30.42333333	-86.685	356	1	108
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5:43:40	03:37:49	0	30.424	-86.685	1	14	172
5:43:45	03:37:54	0	30.4245	-86.685	356	25	184
5:43:50	03:37:59	0	30.42516667	-86.685	356	40	204
5:43:55	03:38:04	0	30.42633333	-86.68516667	357	57	236
5:44:00	03:38:09	0	30.42783333	-86.68533333	356	74	264
5:44:05	03:38:14	0	30.42983333	-86.6855	356	89	276
5:44:10	03:38:19	0	30.432	-86.68566667	355	101	300
5:44:15	03:38:24	0	30.43433333	-86.68583333	358	108	316
5:44:20	03:38:29	0	30.437	-86.68566667	10	108	360
5:44:25	03:38:34	0	30.43933333	-86.68483333	28	106	412
5:44:30	03:38:39	0	30.44116667	-86.683	49	105	440
5:44:35	03:38:44	0	30.4425	-86.68066667	68	105	476
5:44:40	03:38:49	0	30.44333333	-86.678	74	104	552
5:44:45	03:38:54	0	30.44383333	-86.67516667	79	105	628
5:44:50	03:38:59	0	30.44416667	-86.6725	85	107	680
5:44:55	03:39:04	0	30.44433333	-86.6695	91	110	720
5:45:00	03:39:09	0	30.444	-86.6665	107	112	752
5:45:05	03:39:14	0	30.44283333	-86.66383333	124	113	776
5:45:10	03:39:19	0	30.441	-86.66166667	140	114	792
5:45:15	03:39:24	0	30.43883333	-86.66	156	115	800
5:45:20	03:39:29	0	30.43616667	-86.65916667	169	116	804
5:45:25	03:39:34	0	30.4335	-86.65883333	178	118	796

5:45:30	03:39:39	0	30.43083333	-86.65666667	181	119	786
5:45:35	03:39:44	0	30.428	-86.65883333	183	119	788
5:45:40	03:39:49	0	30.42516667	-86.659	184	119	800
5:45:45	03:39:54	0	30.42233333	-86.65916667	184	120	796
5:45:50	03:39:59	0	30.41966667	-86.6595	184	121	788
5:45:55	03:40:04	0	30.41666667	-86.65966667	185	124	764
5:46:00	03:40:09	0	30.41383333	-86.66	184	125	736
5:46:05	03:40:14	0	30.411	-86.66016667	183	126	720
5:46:10	03:40:19	0	30.408	-86.66033333	182	123	720
5:46:15	03:40:24	0	30.40516667	-86.66033333	181	122	712
5:46:20	03:40:29	0	30.40233333	-86.6605	180	120	708
5:46:25	03:40:34	0	30.3995	-86.6605	181	118	716
5:46:30	03:40:39	0	30.39683333	-86.6605	182	118	728
5:46:35	03:40:44	0	30.39416667	-86.66083333	195	113	696
5:46:40	03:40:49	0	30.39183333	-86.66216667	221	110	652
5:46:45	03:40:54	0	30.3905	-86.66466667	255	108	628
5:46:50	03:40:59	0	30.39066667	-86.6675	290	107	584
5:46:55	03:41:04	0	30.39183333	-86.67	309	112	512
5:47:00	03:41:09	0	30.39366667	-86.67216667	317	116	448
5:47:05	03:41:14	0	30.39566667	-86.67433333	315	117	400
5:47:10	03:41:19	0	30.3975	-86.6765	315	114	380
5:47:15	03:41:24	0	30.3995	-86.67866667	316	111	356
5:47:20	03:41:29	0	30.40133333	-86.68066667	321	102	356
5:47:25	03:41:34	0	30.40316667	-86.682	333	89	436
5:47:30	03:41:39	0	30.405	-86.68283333	346	81	488
5:47:35	03:41:44	0	30.40683333	-86.68316667	361	70	508
5:47:40	03:41:49	0	30.40833333	-86.6835	356	63	512
5:47:45	03:41:54	0	30.40966667	-86.6835	357	57	516
5:47:50	03:41:59	0	30.411	-86.68366667	358	54	512
5:47:55	03:42:04	0	30.41216667	-86.68366667	357	55	512
5:48:00	03:42:09	0	30.41333333	-86.68366667	357	48	524
5:48:05	03:42:14	0	30.4145	-86.68383333	356	47	532
5:48:10	03:42:19	0	30.4155	-86.68383333	354	46	544
5:48:15	03:42:24	0	30.41666667	-86.684	351	50	556
5:48:20	03:42:29	0	30.41783333	-86.68433333	349	50	560
5:48:25	03:42:34	0	30.419	-86.6845	350	46	496
5:48:30	03:42:39	0	30.42	-86.68466667	2	36	424
5:48:35	03:42:44	0	30.42066667	-86.6846	0	29	356
5:48:40	03:42:49	0	30.42133333	-86.68466667	355	25	288
5:48:45	03:42:54	0	30.42183333	-86.68466667	352	24	220
5:48:50	03:42:59	0	30.4225	-86.68483333	351	20	168
5:48:55	03:43:04	0	30.42283333	-86.68483333	344	17	128
5:49:00	03:43:09	0	30.42316667	-86.685	346	15	112
5:49:05	03:43:14	0	30.4235	-86.685	353	13	88
5:49:10	03:43:19	0	30.42383333	-86.685	351	13	64
				0			
5:49:52	03:44:01	0	30.42433333	-86.685	351	14	68
5:49:57	03:44:06	0	30.42483333	-86.68516667	358	31	92
5:50:02	03:44:11	0	30.42566667	-86.68516667	355	46	132
5:50:07	03:44:16	0	30.427	-86.68533333	353	60	196
5:50:12	03:44:21	0	30.4285	-86.6855	355	74	252
5:50:17	03:44:26	0	30.43033333	-86.68566667	357	86	296
5:50:22	03:44:31	0	30.4325	-86.6855	11	93	352
5:50:27	03:44:36	0	30.4345	-86.68466667	33	98	404
5:50:32	03:44:41	0	30.43616667	-86.68266667	56	102	456
5:50:37	03:44:46	0	30.43716667	-86.68016667	75	106	488
5:50:42	03:44:51	0	30.4375	-86.67733333	92	110	520
5:50:47	03:44:56	0	30.437	-86.67433333	106	113	576
5:50:52	03:45:01	0	30.436	-86.6715	117	116	624
5:50:57	03:45:06	0	30.43466667	-86.66883333	127	116	688
5:51:02	03:45:11	0	30.43283333	-86.6665	139	117	740
5:51:07	03:45:16	0	30.4305	-86.66466667	151	119	760
5:51:12	03:45:21	0	30.428	-86.6635	164	119	764
5:51:17	03:45:26	0	30.42516667	-86.66283333	174	120	780
5:51:22	03:45:31	0	30.4225	-86.66266667	177	120	788
5:51:27	03:45:36	0	30.41966667	-86.6625	180	120	792

5:51:32	03:45:41	0	30.41683333	-86.6625	182	120	784
5:51:37	03:45:46	0	30.414	-86.66266667	183	120	780
5:51:42	03:45:51	0	30.41116667	-86.66283333	182	121	776
5:51:47	03:45:56	0	30.4085	-86.663	181	121	760
5:51:52	03:46:01	0	30.40566667	-86.663	180	121	760
5:51:57	03:46:06	0	30.40283333	-86.663	179	121	752
5:52:02	03:46:11	0	30.4	-86.66283333	178	120	752
5:52:07	03:46:16	0	30.39716667	-86.66283333	181	118	764
5:52:12	03:46:21	0	30.3945	-86.66316667	198	114	780
5:52:17	03:46:26	0	30.39233333	-86.66466667	223	110	780
5:52:22	03:46:31	0	30.39083333	-86.66716667	249	111	740
5:52:27	03:46:36	0	30.39033333	-86.67016667	270	116	676
5:52:32	03:46:41	0	30.39083333	-86.67316667	288	119	624
5:52:37	03:46:46	0	30.392	-86.67616667	302	119	596
5:52:42	03:46:51	0	30.39366667	-86.67866667	315	117	572
5:52:47	03:46:56	0	30.39583333	-86.68066667	327	111	548
5:52:52	03:47:01	0	30.398	-86.68183333	339	100	568
5:52:57	03:47:06	0	30.40016667	-86.68266667	347	92	592
5:53:02	03:47:11	0	30.40216667	-86.68316667	352	84	612
5:53:07	03:47:16	0	30.404	-86.68333333	357	79	604
5:53:12	03:47:21	0	30.40583333	-86.68333333	359	73	584
5:53:17	03:47:26	0	30.4075	-86.6835	358	64	548
5:53:22	03:47:31	0	30.40883333	-86.6835	2	56	516
5:53:27	03:47:36	0	30.41016667	-86.6835	0	52	508
5:53:32	03:47:41	0	30.41133333	-86.6835	357	52	508
5:53:37	03:47:46	0	30.4125	-86.68366667	352	54	496
5:53:42	03:47:51	0	30.41383333	-86.68383333	348	55	512
5:53:47	03:47:56	0	30.415	-86.68416667	348	54	540
5:53:52	03:48:01	0	30.41616667	-86.6845	350	50	540
5:53:57	03:48:06	0	30.41733333	-86.68466667	357	44	492
5:54:02	03:48:11	0	30.41833333	-86.68466667	3	38	440
5:54:07	03:48:16	0	30.419	-86.6845	4	31	388
5:54:12	03:48:21	0	30.41983333	-86.6845	1	27	344
5:54:17	03:48:26	0	30.42033333	-86.6845	357	25	300
5:54:22	03:48:31	0	30.421	-86.6845	355	25	264
5:54:27	03:48:36	0	30.4215	-86.68466667	354	21	228
5:54:32	03:48:41	0	30.42183333	-86.68466667	342	16	188
5:54:37	03:48:46	0	30.42233333	-86.68483333	349	14	160
5:54:42	03:48:51	0	30.4225	-86.68483333	349	12	136
5:54:47	03:48:56	0	30.42283333	-86.685	352	10	104
5:54:52	03:49:01	0	30.423	-86.685	351	9	88
5:54:57	03:49:06	0	30.42316667	-86.685	353	4	64
5:55:02	03:49:11	0	30.42333333	-86.685	350	2	48
				0			
5:57:10	03:51:19	0	30.42333333	-86.685	351	5	56
5:57:15	03:51:24	0	30.42366667	-86.685	354	20	72
5:57:20	03:51:29	0	30.42433333	-86.685	357	36	92
5:57:25	03:51:34	0	30.42533333	-86.68516667	356	53	120
5:57:30	03:51:39	0	30.42666667	-86.68533333	354	56	168
5:57:35	03:51:44	0	30.42833333	-86.6855	355	76	216
5:57:40	03:51:49	0	30.43016667	-86.68566667	356	83	280
5:57:45	03:51:54	0	30.43216667	-86.68583333	356	89	352
5:57:50	03:51:59	0	30.43433333	-86.68583333	5	93	420
5:57:55	03:52:04	0	30.4365	-86.68533333	21	95	476
5:58:00	03:52:09	0	30.43833333	-86.684	39	96	528
5:58:05	03:52:14	0	30.44	-86.68216667	58	97	588
5:58:10	03:52:19	0	30.44083333	-86.67966667	76	98	632
5:58:15	03:52:24	0	30.44116667	-86.677	90	101	632
5:58:20	03:52:29	0	30.44083333	-86.67433333	104	102	640
5:58:25	03:52:34	0	30.44	-86.67183333	117	103	672
5:58:30	03:52:39	0	30.43866667	-86.6695	128	103	692
5:58:35	03:52:44	0	30.437	-86.6675	138	105	732
5:58:40	03:52:49	0	30.43516667	-86.66566667	147	108	744
5:58:45	03:52:54	0	30.43283333	-86.66433333	159	110	756
5:58:50	03:52:59	0	30.43033333	-86.6635	170	110	756
5:58:55	03:53:04	0	30.42783333	-86.66316667	175	112	752

5:59:00	03:53:09	0	30.42516667	-86.663	179	113	744
5:59:05	03:53:14	0	30.4225	-86.663	181	113	740
5:59:10	03:53:19	0	30.41983333	-86.66316667	183	113	744
5:59:15	03:53:24	0	30.41733333	-86.66333333	183	112	744
5:59:20	03:53:29	0	30.41466667	-86.6635	183	111	752
5:59:25	03:53:34	0	30.41216667	-86.66366667	183	111	760
5:59:30	03:53:39	0	30.4095	-86.66366667	182	111	768
5:59:35	03:53:44	0	30.407	-86.66383333	181	110	772
5:59:40	03:53:49	0	30.40433333	-86.66383333	179	111	768
5:59:45	03:53:54	0	30.40183333	-86.66383333	179	112	756
5:59:50	03:53:59	0	30.39916667	-86.66366667	179	113	744
5:59:55	03:54:04	0	30.3965	-86.66366667	179	113	736
6:00:00	03:54:09	0	30.39383333	-86.66366667	179	113	740
6:00:05	03:54:14	0	30.39116667	-86.6635	179	112	732
6:00:10	03:54:19	0	30.38866667	-86.6635	179	111	728
6:00:15	03:54:24	0	30.38616667	-86.66333333	178	105	776
6:00:20	03:54:29	0	30.38366667	-86.66333333	177	104	808
6:00:25	03:54:34	0	30.38133333	-86.66316667	179	105	836
6:00:30	03:54:39	0	30.37866667	-86.66316667	186	111	808
6:00:35	03:54:44	0	30.37616667	-86.66366667	193	118	772
6:00:40	03:54:49	0	30.3735	-86.66466667	201	123	696
6:00:45	03:54:54	0	30.37083333	-86.66816667	213	124	652
6:00:50	03:54:59	0	30.36866667	-86.66816667	227	117	720
6:00:55	03:55:04	0	30.367	-86.67066667	238	117	748
6:01:00	03:55:09	0	30.36583333	-86.6735	254	114	784
6:01:05	03:55:14	0	30.36566667	-86.6765	278	114	804
6:01:10	03:55:19	0	30.36633333	-86.67933333	296	111	840
6:01:15	03:55:24	0	30.368	-86.68166667	319	111	864
6:01:20	03:55:29	0	30.37016667	-86.68333333	338	113	872
6:01:25	03:55:34	0	30.37266667	-86.684	353	116	860
6:01:30	03:55:39	0	30.37533333	-86.68416667	3	116	844
6:01:35	03:55:44	0	30.37816667	-86.68383333	8	121	816
6:01:40	03:55:49	0	30.381	-86.6835	7	122	780
6:01:45	03:55:54	0	30.38383333	-86.68316667	5	121	756
6:01:50	03:55:59	0	30.38566667	-86.68283333	4	122	712
6:01:55	03:56:04	0	30.3895	-86.68266667	1	120	672
6:02:00	03:56:09	0	30.39216667	-86.68266667	359	114	652
6:02:05	03:56:14	0	30.39483333	-86.68283333	353	110	624
6:02:10	03:56:19	0	30.39733333	-86.68333333	347	106	612
6:02:15	03:56:24	0	30.39966667	-86.68416667	345	102	608
6:02:20	03:56:29	0	30.402	-86.68483333	344	100	576
6:02:25	03:56:34	0	30.40416667	-86.6855	346	93	532
6:02:30	03:56:39	0	30.40616667	-86.686	349	88	492
6:02:35	03:56:44	0	30.40816667	-86.6865	349	82	452
6:02:40	03:56:49	0	30.41	-86.68683333	350	76	420
6:02:45	03:56:54	0	30.41166667	-86.68716667	352	68	388
6:02:50	03:56:59	0	30.41316667	-86.6875	353	60	344
6:02:55	03:57:04	0	30.41433333	-86.6875	354	51	292
6:03:00	03:57:09	0	30.4155	-86.68766667	358	40	248
6:03:05	03:57:14	0	30.41633333	-86.68766667	0	30	208
6:03:10	03:57:19	0	30.417	-86.68766667	355	24	180
6:03:15	03:57:24	0	30.4175	-86.68783333	352	20	148
6:03:20	03:57:29	0	30.41783333	-86.68783333	354	17	120
6:03:25	03:57:34	0	30.41816667	-86.68783333	353	12	100
6:03:30	03:57:39	0	30.4185	-86.688	350	8	92
6:03:35	03:57:44	0	30.41866667	-86.688	353	3	76
6:03:40	03:57:49	0	30.41866667	-86.688	355	1	64
6:03:45	03:57:54	0	30.41866667	-86.688	351	2	52
6:03:50	03:57:59	0	30.41866667	-86.688	352	1	56
6:03:55	03:58:04	0	30.41866667	-86.688	337	1	56
6:04:00	03:58:09	0	30.41883333	-86.688	318	0	48
6:04:05	03:58:14	0	30.41883333	-86.688	298	0	52
6:04:10	03:58:19	0	30.41883333	-86.688	278	1	56
6:04:15	03:58:24	0	30.41883333	-86.688	243	0	60
6:04:20	03:58:29	0	30.41866667	-86.688	204	2	64
6:04:25	03:58:34	0	30.41866667	-86.688	165	1	64

6:04:30	03:58:39	0	30.41866667	-86.688	121	1	68
6:04:35	03:58:44	0	30.41866667	-86.688	75	2	72
6:04:40	03:58:49	0	30.41866667	-86.688	31	3	72
6:04:45	03:58:54	0	30.41866667	-86.688	356	1	72
6:04:50	03:58:59	0	30.41866667	-86.688	354	1	64
6:04:55	03:59:04	0	30.41866667	-86.688	355	1	56
6:05:00	03:59:09	0	30.41883333	-86.688	349	3	44
				0			
6:06:02	04:00:11	0	30.41883333	-86.688	352	3	52
6:06:07	04:00:16	0	30.41916667	-86.686	356	19	64
6:06:12	04:00:21	0	30.41983333	-86.68816667	356	42	76
6:06:17	04:00:26	0	30.421	-86.68816667	356	66	80
6:06:22	04:00:31	0	30.42283333	-86.68833333	356	83	88
6:06:27	04:00:36	0	30.42483333	-86.6885	356	93	120
6:06:32	04:00:41	0	30.42716667	-86.68866667	356	99	172
6:06:37	04:00:46	0	30.4295	-86.68883333	355	103	216
6:06:42	04:00:51	0	30.43183333	-86.689	356	104	244
6:06:47	04:00:56	0	30.43433333	-86.68933333	356	106	276
6:06:52	04:01:01	0	30.43683333	-86.6895	356	105	328
6:06:57	04:01:06	0	30.43916667	-86.68966667	357	104	408
6:07:02	04:01:11	0	30.44166667	-86.68983333	358	104	484
6:07:07	04:01:16	0	30.444	-86.68983333	357	106	568
6:07:12	04:01:21	0	30.4465	-86.69	357	107	652
6:07:17	04:01:26	0	30.449	-86.69016667	356	107	700
6:07:22	04:01:31	0	30.4515	-86.6905	355	107	740
6:07:27	04:01:36	0	30.454	-86.69066667	355	106	760
6:07:32	04:01:41	0	30.4565	-86.691	354	104	764
6:07:37	04:01:46	0	30.45883333	-86.69133333	353	103	764
6:07:42	04:01:51	0	30.46116667	-86.69166667	353	103	772
6:07:47	04:01:56	0	30.46366667	-86.692	353	105	768
6:07:52	04:02:01	0	30.466	-86.69233333	350	107	784
6:07:57	04:02:06	0	30.4685	-86.69216667	11	107	796
6:08:02	04:02:11	0	30.471	-86.69133333	26	107	804
6:08:07	04:02:16	0	30.473	-86.68983333	40	108	812
6:08:12	04:02:21	0	30.47466667	-86.68766667	56	107	840
6:08:17	04:02:26	0	30.47583333	-86.68516667	69	107	864
6:08:22	04:02:31	0	30.4765	-86.68233333	80	108	884
6:08:27	04:02:36	0	30.47666667	-86.6795	93	106	904
6:08:32	04:02:41	0	30.47616667	-86.67666667	107	106	909
6:08:37	04:02:46	0	30.47533333	-86.674	120	106	892
6:08:42	04:02:51	0	30.47383333	-86.67183333	132	107	888
6:08:47	04:02:56	0	30.472	-86.66983333	143	108	888
6:08:52	04:03:01	0	30.46983333	-86.66816667	152	108	896
6:08:57	04:03:06	0	30.4675	-86.66716667	161	108	892
6:09:02	04:03:11	0	30.465	-86.66633333	168	108	896
6:09:07	04:03:16	0	30.46266667	-86.66566667	168	108	892
6:09:12	04:03:21	0	30.46016667	-86.66516667	167	107	888
6:09:17	04:03:26	0	30.45766667	-86.6645	168	105	884
6:09:22	04:03:31	0	30.45533333	-86.664	169	104	876
6:09:27	04:03:36	0	30.453	-86.6635	170	103	876
6:09:32	04:03:41	0	30.45066667	-86.663	171	101	876
6:09:37	04:03:46	0	30.44833333	-86.66266667	172	100	880
6:09:42	04:03:51	0	30.446	-86.66233333	174	99	884
6:09:47	04:03:56	0	30.44366667	-86.662	174	100	872
6:09:52	04:04:01	0	30.44133333	-86.66183333	175	102	860
6:09:57	04:04:06	0	30.439	-86.6615	175	103	848
6:10:02	04:04:11	0	30.4365	-86.66133333	176	104	844
6:10:07	04:04:16	0	30.43416667	-86.66116667	177	104	840
6:10:12	04:04:21	0	30.43166667	-86.66116667	178	105	852
6:10:17	04:04:26	0	30.42916667	-86.661	179	105	852
6:10:22	04:04:31	0	30.42683333	-86.661	179	105	860
6:10:27	04:04:36	0	30.42433333	-86.661	179	104	880
6:10:32	04:04:41	0	30.42183333	-86.66083333	178	103	900
6:10:37	04:04:46	0	30.4195	-86.66083333	178	103	928
6:10:42	04:04:51	0	30.41716667	-86.66066667	179	102	952
6:10:47	04:04:56	0	30.41483333	-86.66066667	179	101	980

6:10:52	04:05:01	0	30.4125	-86.66066667	181	99	1012
6:10:57	04:05:06	0	30.41016667	-86.66066667	181	98	1044
6:11:02	04:05:11	0	30.40783333	-86.66083333	181	97	1064
6:11:07	04:05:16	0	30.40566667	-86.66083333	180	96	1064
6:11:12	04:05:21	0	30.40333333	-86.66083333	180	96	1040
6:11:17	04:05:26	0	30.40116667	-86.66083333	180	95	1000
6:11:22	04:05:31	0	30.39883333	-86.66083333	181	95	952
6:11:27	04:05:36	0	30.39666667	-86.66116667	200	96	900
6:11:32	04:05:41	0	30.39483333	-86.6625	227	96	844
6:11:37	04:05:46	0	30.39383333	-86.66483333	253	97	772
6:11:42	04:05:51	0	30.39366667	-86.6675	271	100	720
6:11:47	04:05:56	0	30.39366667	-86.67016667	273	102	712
6:11:52	04:06:01	0	30.39383333	-86.67283333	275	100	724
6:11:57	04:06:06	0	30.394	-86.6755	278	96	732
6:12:02	04:06:11	0	30.39466667	-86.67783333	298	82	744
6:12:07	04:06:16	0	30.39566667	-86.6795	314	70	744
6:12:12	04:06:21	0	30.39683333	-86.68066667	325	63	720
6:12:17	04:06:26	0	30.39816667	-86.6815	331	60	672
6:12:22	04:06:31	0	30.39933333	-86.68216667	337	58	632
6:12:27	04:06:36	0	30.40066667	-86.68266667	342	58	612
6:12:32	04:06:41	0	30.402	-86.68316667	347	59	604
6:12:37	04:06:46	0	30.40333333	-86.6835	351	58	584
6:12:42	04:06:51	0	30.4045	-86.68366667	358	53	572
6:12:47	04:06:56	0	30.40566667	-86.68366667	357	50	556
6:12:52	04:07:01	0	30.407	-86.68366667	354	51	556
6:12:57	04:07:06	0	30.40816667	-86.68383333	352	50	556
6:13:02	04:07:11	0	30.40916667	-86.684	354	49	552
6:13:07	04:07:16	0	30.41033333	-86.68416667	359	49	560
6:13:12	04:07:21	0	30.4115	-86.68416667	1	50	564
6:13:17	04:07:26	0	30.41266667	-86.68416667	359	51	568
6:13:22	04:07:31	0	30.414	-86.68416667	356	49	564
6:13:27	04:07:36	0	30.415	-86.68433333	355	45	544
6:13:32	04:07:41	0	30.416	-86.68433333	0	40	480
6:13:37	04:07:46	0	30.41683333	-86.68433333	358	35	440
6:13:42	04:07:51	0	30.41766667	-86.6845	353	30	420
6:13:47	04:07:56	0	30.41833333	-86.6845	354	27	380
6:13:52	04:08:01	0	30.419	-86.68466667	357	23	336
6:13:57	04:08:06	0	30.4195	-86.68466667	356	25	300
6:14:02	04:08:11	0	30.42016667	-86.68466667	355	23	268
6:14:07	04:08:16	0	30.4205	-86.68483333	354	21	220
6:14:12	04:08:21	0	30.42116667	-86.68483333	354	22	192
6:14:17	04:08:26	0	30.42166667	-86.68483333	356	20	164
6:14:22	04:08:31	0	30.422	-86.68483333	356	17	140
6:14:27	04:08:36	0	30.42233333	-86.685	357	14	116
6:14:32	04:08:41	0	30.42266667	-86.685	357	11	104
6:14:37	04:08:46	0	30.42283333	-86.685	356	8	88
6:14:42	04:08:51	0	30.423	-86.685	356	6	72
6:14:47	04:08:56	0	30.42316667	-86.685	357	5	48
				0			
6:16:21	04:10:30	0	30.42333333	-86.685	355	1	56
6:16:26	04:10:35	0	30.4235	-86.685	350	13	76
6:16:31	04:10:40	0	30.424	-86.685	359	31	92
6:16:36	04:10:45	0	30.42483333	-86.68516667	353	48	124
6:16:41	04:10:50	0	30.42616667	-86.68533333	353	62	164
6:16:46	04:10:55	0	30.42783333	-86.6855	354	73	204
6:16:51	04:11:00	0	30.4295	-86.68566667	354	82	248
6:16:56	04:11:05	0	30.4315	-86.68583333	356	89	292
6:17:01	04:11:10	0	30.43366667	-86.686	358	93	340
6:17:06	04:11:15	0	30.43583333	-86.68616667	359	97	380
6:17:11	04:11:20	0	30.43816667	-86.68516667	1	99	428
6:17:16	04:11:25	0	30.4405	-86.68566667	16	100	464
6:17:21	04:11:30	0	30.4425	-86.6845	41	100	492
6:17:26	04:11:35	0	30.444	-86.68233333	63	101	520
6:17:31	04:11:40	0	30.44466667	-86.67983333	82	102	552
6:17:36	04:11:45	0	30.44483333	-86.67816667	85	104	556
6:17:41	04:11:50	0	30.445	-86.67416667	85	105	552

6:17:46	04:11:55	0	30.44533333	-86.6715	84	104	592
6:17:51	04:12:00	0	30.4455	-86.66866667	83	102	632
6:17:56	04:12:05	0	30.44583333	-86.666	84	97	692
6:18:01	04:12:10	0	30.446	-86.66333333	90	96	736
6:18:06	04:12:15	0	30.44566667	-86.66083333	103	95	772
6:18:11	04:12:20	0	30.445	-86.6585	116	96	804
6:18:16	04:12:25	0	30.44366667	-86.65633333	131	94	848
6:18:21	04:12:30	0	30.44216667	-86.65466667	145	96	884
6:18:26	04:12:35	0	30.44016667	-86.65333333	157	97	908
6:18:31	04:12:40	0	30.438	-86.6525	165	100	924
6:18:36	04:12:45	0	30.43566667	-86.65183333	171	104	920
6:18:41	04:12:50	0	30.43316667	-86.6515	174	107	920
6:18:46	04:12:55	0	30.43066667	-86.65133333	177	111	908
6:18:51	04:13:00	0	30.428	-86.65116667	179	115	880
6:18:56	04:13:05	0	30.42533333	-86.65116667	180	117	856
6:19:01	04:13:10	0	30.42266667	-86.65116667	180	112	856
6:19:06	04:13:15	0	30.42	-86.65116667	180	108	844
6:19:11	04:13:20	0	30.4175	-86.65116667	181	105	824
6:19:16	04:13:25	0	30.41516667	-86.65116667	180	103	808
6:19:21	04:13:30	0	30.41283333	-86.65133333	180	102	792
6:19:26	04:13:35	0	30.41033333	-86.65133333	180	101	776
6:19:31	04:13:40	0	30.408	-86.65133333	179	101	776
6:19:36	04:13:45	0	30.40566667	-86.65116667	178	101	776
6:19:41	04:13:50	0	30.40333333	-86.65116667	179	101	780
6:19:46	04:13:55	0	30.401	-86.65116667	180	102	768
6:19:51	04:14:00	0	30.39866667	-86.65116667	184	100	772
6:19:56	04:14:05	0	30.39633333	-86.65166667	202	94	804
6:20:01	04:14:10	0	30.3945	-86.653	225	92	804
6:20:06	04:14:15	0	30.3935	-86.65516667	252	92	784
6:20:11	04:14:20	0	30.39316667	-86.65766667	271	96	732
6:20:16	04:14:25	0	30.39333333	-86.66016667	278	98	692
6:20:21	04:14:30	0	30.39366667	-86.66283333	280	96	648
6:20:26	04:14:35	0	30.39416667	-86.66533333	282	93	620
6:20:31	04:14:40	0	30.3945	-86.66783333	282	92	596
6:20:36	04:14:45	0	30.395	-86.67016667	284	92	576
6:20:41	04:14:50	0	30.39566667	-86.6725	289	90	572
6:20:46	04:14:55	0	30.39633333	-86.67483333	292	90	576
6:20:51	04:15:00	0	30.39716667	-86.677	297	87	580
6:20:56	04:15:05	0	30.39816667	-86.679	302	88	584
6:21:01	04:15:10	0	30.3995	-86.68083333	317	83	600
6:21:06	04:15:15	0	30.401	-86.68216667	332	79	612
6:21:11	04:15:20	0	30.40266667	-86.68283333	343	73	636
6:21:16	04:15:25	0	30.40433333	-86.68333333	351	76	632
6:21:21	04:15:30	0	30.40616667	-86.68366667	355	76	592
6:21:26	04:15:35	0	30.40783333	-86.68366667	356	76	544
6:21:31	04:15:40	0	30.40966667	-86.68383333	357	74	508
6:21:36	04:15:45	0	30.41133333	-86.684	357	71	476
6:21:41	04:15:50	0	30.41283333	-86.684	357	64	452
6:21:46	04:15:55	0	30.41433333	-86.68416667	356	56	424
6:21:51	04:16:00	0	30.4155	-86.68433333	354	47	408
6:21:56	04:16:05	0	30.4165	-86.68433333	355	41	372
6:22:01	04:16:10	0	30.4175	-86.6845	356	37	336
6:22:06	04:16:15	0	30.41833333	-86.6845	358	34	304
6:22:11	04:16:20	0	30.419	-86.6845	358	31	272
6:22:16	04:16:25	0	30.41966667	-86.68466667	354	28	236
6:22:21	04:16:30	0	30.42033333	-86.68466667	354	25	216
6:22:26	04:16:35	0	30.421	-86.68483333	353	23	192
6:22:31	04:16:40	0	30.4215	-86.68483333	355	20	160
6:22:36	04:16:45	0	30.42183333	-86.68483333	355	18	132
6:22:41	04:16:50	0	30.42216667	-86.685	354	14	112
6:22:46	04:16:55	0	30.4225	-86.685	353	12	100
6:22:51	04:17:00	0	30.42283333	-86.685	353	10	92
6:22:56	04:17:05	0	30.423	-86.685	353	8	80
6:23:01	04:17:10	0	30.42316667	-86.685	355	5	68
6:23:06	04:17:15	0	30.42333333	-86.685	351	3	48
6:23:11	04:17:20	0	30.42333333	-86.685	350	1	32

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6:24:17	04:18:26	0	30.42333333	-86.685	350	2	60
6:24:22	04:18:31	0	30.4235	-86.685	350	14	80
6:24:27	04:18:36	0	30.424	-86.685	356	30	104
6:24:32	04:18:41	0	30.425	-86.68516667	354	49	128
6:24:37	04:18:46	0	30.42833333	-86.68533333	350	56	150
6:24:42	04:18:51	0	30.428	-86.68566667	351	81	186
6:24:47	04:18:56	0	30.43	-86.686	354	92	208
6:24:52	04:19:01	0	30.43216667	-86.68633333	355	99	246
6:24:57	04:19:06	0	30.4345	-86.6865	356	105	292
6:25:02	04:19:11	0	30.437	-86.6865	6	105	352
6:25:07	04:19:16	0	30.43933333	-86.68583333	25	102	420
6:25:12	04:19:21	0	30.44116667	-86.68416667	49	99	488
6:25:17	04:19:26	0	30.44283333	-86.68183333	71	100	532
6:25:22	04:19:31	0	30.44283333	-86.67916667	83	103	588
6:25:27	04:19:36	0	30.443	-86.6765	86	105	616
6:25:32	04:19:41	0	30.44316667	-86.67366667	87	106	660
6:25:37	04:19:46	0	30.44333333	-86.67083333	89	101	752
6:25:42	04:19:51	0	30.44316667	-86.66816667	100	96	848
6:25:47	04:19:56	0	30.4425	-86.66566667	115	94	916
6:25:52	04:20:01	0	30.44133333	-86.66366667	131	93	992
6:25:57	04:20:06	0	30.43966667	-86.662	150	93	1060
6:26:02	04:20:11	0	30.43766667	-86.66116667	168	94	1096
6:26:07	04:20:16	0	30.4355	-86.66083333	182	96	1112
6:26:12	04:20:21	0	30.43316667	-86.661	194	96	1104
6:26:17	04:20:26	0	30.431	-86.66116667	184	94	1112
6:26:22	04:20:31	0	30.42883333	-86.66133333	184	91	1096
6:26:27	04:20:36	0	30.42666667	-86.6615	184	89	1084
6:26:32	04:20:41	0	30.42466667	-86.66183333	185	90	1044
6:26:37	04:20:46	0	30.4225	-86.662	184	91	1008
6:26:42	04:20:51	0	30.4205	-86.66216667	183	91	972
6:26:47	04:20:56	0	30.41833333	-86.66216667	182	92	948
6:26:52	04:21:01	0	30.41616667	-86.66233333	181	93	936
6:26:57	04:21:06	0	30.414	-86.66233333	181	95	932
6:27:02	04:21:11	0	30.41166667	-86.66233333	180	95	917
6:27:07	04:21:16	0	30.4095	-86.66233333	180	97	908
6:27:12	04:21:21	0	30.40716667	-86.66233333	180	98	896
6:27:17	04:21:26	0	30.40483333	-86.66233333	180	100	876
6:27:22	04:21:31	0	30.4025	-86.66233333	178	103	860
6:27:27	04:21:36	0	30.40016667	-86.66216667	179	104	864
6:27:32	04:21:41	0	30.39766667	-86.66216667	178	102	886
6:27:37	04:21:46	0	30.39533333	-86.662	177	102	900
6:27:42	04:21:51	0	30.393	-86.66183333	177	100	904
6:27:47	04:21:56	0	30.39066667	-86.66166667	178	97	928
6:27:52	04:22:01	0	30.3885	-86.66166667	179	93	948
6:27:57	04:22:06	0	30.38633333	-86.66166667	181	91	956
6:28:02	04:22:11	0	30.38416667	-86.66166667	182	91	952
6:28:07	04:22:16	0	30.382	-86.66183333	182	90	944
6:28:12	04:22:21	0	30.38	-86.662	182	89	940
6:28:17	04:22:26	0	30.37783333	-86.662	184	90	928
6:28:22	04:22:31	0	30.37583333	-86.66216667	185	90	908
6:28:27	04:22:36	0	30.37366667	-86.6625	186	90	896
6:28:32	04:22:41	0	30.37166667	-86.66266667	186	91	872
6:28:37	04:22:46	0	30.3695	-86.663	186	91	860
6:28:42	04:22:51	0	30.36733333	-86.66316667	188	90	860
6:28:47	04:22:56	0	30.36533333	-86.66366667	195	89	868
6:28:52	04:23:01	0	30.36333333	-86.66516667	207	90	868
6:28:57	04:23:06	0	30.36166667	-86.66583333	221	92	868
6:29:02	04:23:11	0	30.36016667	-86.66766667	236	93	872
6:29:07	04:23:16	0	30.35916667	-86.67	251	94	872
6:29:12	04:23:21	0	30.35866667	-86.67233333	263	95	872
6:29:17	04:23:26	0	30.35866667	-86.675	278	96	868
6:29:22	04:23:31	0	30.3595	-86.67733333	304	95	856
6:29:27	04:23:36	0	30.361	-86.679	331	95	840
6:29:32	04:23:41	0	30.36316667	-86.68	349	97	816
6:29:37	04:23:46	0	30.36533333	-86.68033333	355	99	804

6:29:42	04:23:51	0	30.36766667	-86.6805	357	102	792
6:29:47	04:23:56	0	30.37016667	-86.68066667	0	103	760
6:29:52	04:24:01	0	30.3725	-86.6805	0	103	724
6:29:57	04:24:06	0	30.375	-86.68066667	359	102	688
6:30:02	04:24:11	0	30.37733333	-86.68066667	356	101	652
6:30:07	04:24:16	0	30.37966667	-86.68083333	355	100	624
6:30:12	04:24:21	0	30.382	-86.68116667	356	100	592
6:30:17	04:24:26	0	30.38433333	-86.68133333	357	100	548
6:30:22	04:24:31	0	30.38666667	-86.6815	358	101	476
6:30:27	04:24:36	0	30.389	-86.6815	358	101	408
6:30:32	04:24:41	0	30.39133333	-86.68166667	356	100	348
6:30:37	04:24:46	0	30.39366667	-86.68183333	355	99	292
6:30:42	04:24:51	0	30.396	-86.68216667	352	97	264
6:30:47	04:24:56	0	30.39816667	-86.6825	351	94	252
6:30:52	04:25:01	0	30.40033333	-86.68233333	354	91	256
6:30:57	04:25:06	0	30.40233333	-86.683	353	89	260
6:31:02	04:25:11	0	30.40433333	-86.68333333	355	86	260
6:31:07	04:25:16	0	30.40633333	-86.6835	354	82	252
6:31:12	04:25:21	0	30.40816667	-86.68366667	355	77	248
6:31:17	04:25:26	0	30.41	-86.68383333	355	74	240
6:31:22	04:25:31	0	30.41166667	-86.684	355	72	224
6:31:27	04:25:36	0	30.41333333	-86.68416667	356	68	192
6:31:32	04:25:41	0	30.41483333	-86.68433333	357	63	180
6:31:37	04:25:46	0	30.41616667	-86.6845	355	56	168
6:31:42	04:25:51	0	30.4175	-86.68466667	356	47	176
6:31:47	04:25:56	0	30.4185	-86.68466667	356	43	156
6:31:52	04:26:01	0	30.4195	-86.68466667	356	40	128
6:31:57	04:26:06	0	30.42033333	-86.68483333	356	37	108
6:32:02	04:26:11	0	30.42116667	-86.68483333	357	37	72
6:32:07	04:26:16	0	30.422	-86.685	356	21	56
				0			
6:42:25	04:36:34	0	30.42483333	-86.68516667	342	3	56
6:42:30	04:36:39	0	30.425	-86.68516667	347	18	84
6:42:35	04:36:44	0	30.42566667	-86.68533333	350	39	116
6:42:40	04:36:49	0	30.42666667	-86.68566667	347	58	144
6:42:45	04:36:54	0	30.42833333	-86.686	347	74	176
6:42:50	04:36:59	0	30.43	-86.6865	340	85	212
6:42:55	04:37:04	0	30.432	-86.68683333	354	91	256
6:43:00	04:37:09	0	30.43433333	-86.687	357	96	284
6:43:05	04:37:14	0	30.4365	-86.687	359	99	308
6:43:10	04:37:19	0	30.43883333	-86.687	4	101	316
6:43:15	04:37:24	0	30.44116667	-86.68666667	10	100	336
6:43:20	04:37:29	0	30.4435	-86.68616667	15	99	364
6:43:25	04:37:34	0	30.44566667	-86.68533333	21	100	388
6:43:30	04:37:39	0	30.44783333	-86.68416667	30	100	388
6:43:35	04:37:44	0	30.44966667	-86.68266667	38	100	368
6:43:40	04:37:49	0	30.4515	-86.681	40	98	344
6:43:45	04:37:54	0	30.45316667	-86.67933333	41	96	340
6:43:50	04:37:59	0	30.455	-86.6775	41	96	328
6:43:55	04:38:04	0	30.45666667	-86.67583333	41	99	308
6:44:00	04:38:09	0	30.45833333	-86.674	41	100	304
6:44:05	04:38:14	0	30.46016667	-86.67233333	41	99	380
6:44:10	04:38:19	0	30.46183333	-86.6705	41	99	488
6:44:15	04:38:24	0	30.46366667	-86.66866667	41	102	544
6:44:20	04:38:29	0	30.4655	-86.66683333	42	105	580
6:44:25	04:38:34	0	30.46733333	-86.665	42	108	576
6:44:30	04:38:39	0	30.46916667	-86.663	42	110	560
6:44:35	04:38:44	0	30.47116667	-86.661	40	112	504
6:44:40	04:38:49	0	30.47316667	-86.65916667	40	111	468
6:44:45	04:38:54	0	30.475	-86.65716667	41	107	456
6:44:50	04:38:59	0	30.477	-86.65533333	41	106	436
6:44:55	04:39:04	0	30.47883333	-86.6535	39	105	428
6:45:00	04:39:09	0	30.48066667	-86.65166667	39	107	392
6:45:05	04:39:14	0	30.48266667	-86.65	37	107	352
6:45:10	04:39:19	0	30.48466667	-86.64816667	38	106	348
6:45:15	04:39:24	0	30.48666667	-86.6465	36	106	324

6:45:20	04:39:29	0	30.48866667	-86.64466667	38	106	304
6:45:25	04:39:34	0	30.4905	-86.643	40	105	300
6:45:30	04:39:39	0	30.49233333	-86.64116667	41	103	296
6:45:35	04:39:44	0	30.49416667	-86.63933333	41	103	292
6:45:40	04:39:49	0	30.496	-86.6375	40	102	296
6:45:45	04:39:54	0	30.49783333	-86.63566333	39	102	304
6:45:50	04:39:59	0	30.49966667	-86.634	38	102	308
6:45:55	04:40:04	0	30.5015	-86.63233333	37	103	292
6:46:00	04:40:09	0	30.5035	-86.63066667	37	105	288
6:46:05	04:40:14	0	30.5055	-86.629	36	105	280
6:46:10	04:40:19	0	30.5075	-86.6275	32	105	292
6:46:15	04:40:24	0	30.50966667	-86.626	28	105	316
6:46:20	04:40:29	0	30.51183333	-86.62483333	23	105	324
6:46:25	04:40:34	0	30.51416667	-86.62383333	18	105	328
6:46:30	04:40:39	0	30.5165	-86.62316667	11	105	336
6:46:35	04:40:44	0	30.51883333	-86.62266667	6	103	352
6:46:40	04:40:49	0	30.52133333	-86.62233333	8	102	364
6:46:45	04:40:54	0	30.52366667	-86.622	10	101	360
6:46:50	04:40:59	0	30.525	-86.6215	10	100	344
6:46:55	04:41:04	0	30.52916667	-86.621	10	97	340
6:47:00	04:41:09	0	30.53033333	-86.6205	10	95	344
6:47:05	04:41:14	0	30.5325	-86.62016667	10	94	348
6:47:10	04:41:19	0	30.53466667	-86.61966667	10	93	352
6:47:15	04:41:24	0	30.53683333	-86.61916667	10	92	352
6:47:20	04:41:29	0	30.539	-86.61883333	9	92	348
6:47:25	04:41:34	0	30.541	-86.6185	8	91	356
6:47:30	04:41:39	0	30.54316667	-86.61816667	8	90	372
6:47:35	04:41:44	0	30.54516667	-86.61766667	8	89	372
6:47:40	04:41:49	0	30.54733333	-86.6175	9	91	364
6:47:45	04:41:54	0	30.5495	-86.617	9	93	356
6:47:50	04:41:59	0	30.55166667	-86.61666667	8	93	360
6:47:55	04:42:04	0	30.55383333	-86.61633333	7	94	368
6:48:00	04:42:09	0	30.556	-86.616	7	96	364
6:48:05	04:42:14	0	30.55816667	-86.61566667	8	96	364
6:48:10	04:42:19	0	30.56033333	-86.61533333	9	97	352
6:48:15	04:42:24	0	30.56266667	-86.61483333	10	100	328
6:48:20	04:42:29	0	30.565	-86.61433333	11	102	304
6:48:25	04:42:34	0	30.56733333	-86.61383333	11	103	292
6:48:30	04:42:39	0	30.56966667	-86.61316667	12	104	300
6:48:35	04:42:44	0	30.572	-86.61266667	11	104	316
6:48:40	04:42:49	0	30.5745	-86.61216667	11	104	316
6:48:45	04:42:54	0	30.57683333	-86.61166667	11	104	328
6:48:50	04:42:59	0	30.57916667	-86.611	10	104	324
6:48:55	04:43:04	0	30.58166667	-86.61066667	10	103	332
6:49:00	04:43:09	0	30.584	-86.61016667	10	102	340
6:49:05	04:43:14	0	30.58633333	-86.60966667	10	103	340
6:49:10	04:43:19	0	30.58866667	-86.60916667	11	103	344
6:49:15	04:43:24	0	30.591	-86.6085	11	102	336
6:49:20	04:43:29	0	30.59333333	-86.608	12	101	352
6:49:25	04:43:34	0	30.59566667	-86.6075	12	101	348
6:49:30	04:43:39	0	30.598	-86.607	11	102	236
6:49:35	04:43:44	0	30.60033333	-86.60633333	11	102	340
6:49:40	04:43:49	0	30.6025	-86.60583333	11	102	340
6:49:45	04:43:54	0	30.60483333	-86.60533333	11	102	348
6:49:50	04:43:59	0	30.60716667	-86.60483333	11	102	344
6:49:55	04:44:04	0	30.6095	-86.60433333	11	101	336
6:50:00	04:44:09	0	30.61183333	-86.60383333	10	101	336
6:50:05	04:44:14	0	30.61416667	-86.60333333	10	100	336
6:50:10	04:44:19	0	30.6165	-86.60283333	11	98	340
6:50:15	04:44:24	0	30.61866667	-86.60233333	10	97	356
6:50:20	04:44:29	0	30.621	-86.602	9	96	352
6:50:25	04:44:34	0	30.62316667	-86.60166667	9	96	340
6:50:30	04:44:39	0	30.62533333	-86.60116667	9	94	352
6:50:35	04:44:44	0	30.6275	-86.60083333	10	91	368
6:50:40	04:44:49	0	30.6295	-86.60033333	10	90	376
6:50:45	04:44:54	0	30.63166667	-86.6	10	91	368

6:50:50	04:44:59	0	30.63366667	-86.5995	10	91	364
6:50:55	04:45:04	0	30.63583333	-86.59916667	11	91	364
6:51:00	04:45:09	0	30.63783333	-86.59866667	11	91	380
6:51:05	04:45:14	0	30.64	-86.59816667	11	93	400
6:51:10	04:45:19	0	30.64216667	-86.59766667	11	95	412
6:51:15	04:45:24	0	30.64433333	-86.59716667	10	96	424
6:51:20	04:45:29	0	30.6465	-86.59666667	9	98	404
6:51:25	04:45:34	0	30.64883333	-86.59633333	8	99	376
6:51:30	04:45:39	0	30.651	-86.59583333	9	98	364
6:51:35	04:45:44	0	30.65333333	-86.5955	8	98	360
6:51:40	04:45:49	0	30.65566667	-86.59566667	344	98	396
6:51:45	04:45:54	0	30.65766667	-86.59683333	317	100	412
6:51:50	04:45:59	0	30.659	-86.599	296	101	412
6:51:55	04:46:04	0	30.66083333	-86.60166667	288	103	388
6:52:00	04:46:09	0	30.6605	-86.60433333	287	104	376
6:52:05	04:46:14	0	30.66116667	-86.607	285	106	372
6:52:10	04:46:19	0	30.66183333	-86.60983333	283	109	372
6:52:15	04:46:24	0	30.66233333	-86.61266667	282	110	372
6:52:20	04:46:29	0	30.66283333	-86.61566667	282	112	372
6:52:25	04:46:34	0	30.66333333	-86.6185	285	111	364
6:52:30	04:46:39	0	30.6645	-86.62116667	306	106	364
6:52:35	04:46:44	0	30.66633333	-86.623	335	101	360
6:52:40	04:46:49	0	30.6685	-86.62366667	359	100	332
6:52:45	04:46:54	0	30.67083333	-86.62316667	22	98	312
6:52:50	04:46:59	0	30.67266667	-86.62166667	46	98	312
6:52:55	04:47:04	0	30.674	-86.6195	70	99	328
6:53:00	04:47:09	0	30.67433333	-86.61683333	90	100	340
6:53:05	04:47:14	0	30.67433333	-86.61416667	90	100	324
6:53:10	04:47:19	0	30.67433333	-86.6115	90	99	308
6:53:15	04:47:24	0	30.67433333	-86.60883333	89	99	308
6:53:20	04:47:29	0	30.67433333	-86.60633333	90	93	312
6:53:25	04:47:34	0	30.67433333	-86.60383333	90	83	316
6:53:30	04:47:39	0	30.67433333	-86.60183333	91	73	320
6:53:35	04:47:44	0	30.67433333	-86.6	92	66	340
6:53:40	04:47:49	0	30.67416667	-86.59833333	94	58	360
6:53:45	04:47:54	0	30.674	-86.59683333	96	54	388
6:53:50	04:47:59	0	30.674	-86.59533333	95	51	388
6:53:55	04:48:04	0	30.67383333	-86.594	87	49	356
6:54:00	04:48:09	0	30.674	-86.59283333	80	40	328
6:54:05	04:48:14	0	30.67416667	-86.59183333	72	29	300
6:54:10	04:48:19	0	30.67433333	-86.59133333	79	19	284
6:54:15	04:48:24	0	30.67433333	-86.59083333	85	9	264
6:54:20	04:48:29	0	30.67433333	-86.59066667	90	4	256
6:54:25	04:48:34	0	30.67433333	-86.59033333	97	24	256
6:54:30	04:48:39	0	30.67416667	-86.5895	122	41	256
6:54:35	04:48:44	0	30.67333333	-86.58883333	164	47	256
6:54:40	04:48:49	0	30.67233333	-86.589	228	45	244
6:54:45	04:48:54	0	30.67216667	-86.59	288	38	244
6:54:50	04:48:59	0	30.6725	-86.59066667	329	26	240
6:54:55	04:49:04	0	30.673	-86.591	337	20	236
6:55:00	04:49:09	0	30.6735	-86.59116667	340	16	216
6:55:05	04:49:14	0	30.67383333	-86.59133333	353	14	196
6:55:10	04:49:19	0	30.674	-86.59133333	191	3	112

	TIME	WOW 1=TRUE	Lat_System degrees	Long_System degrees	Groundtrack_System degrees	Groundspeed_System knots	Altitude_System feet above MSL	THDG_Sys degrees
	04:49:20							
6:56:15	04:49:24	0	30.674	-86.59133333	334	0	108	
6:56:20	04:49:29	0	30.674	-86.59133333	333	0	112	
	04:49:32		30.674038	-86.591308	333.4	0.13	112	333.4

Pitch_Sys	Roll_Sys	VN_Sys	VE_Sys	VV_Sys	VN_GPS	VE_GPS	VV_GPS	Altitude_GPS	Lat_GPS	Long_GPS	Altitude_INS
degrees	degrees	fps	fps	fps	fps	fps	fps	feet	degrees	degrees	feet

Pitch_Sys degrees	Roll_Sys degrees	VN_Sys fps	VE_Sys fps	VV_Sys fps	VN_GPS fps	VE_GPS fps	VV_GPS fps	Altitude_GPS feet	Lat_GPS degrees	Long_GPS degrees	Altitude_INS feet
					3.31	10.1	-9.484	100	30.673997	-86.5913215	
0.236	-10.5	-0.068	-0.202	0.504							112

Lat_INS	Long_INS	VN_INS	VE_INS	VV_INS	AN_INS	AE_INS	AZ_INS	Pitch_INS	Roll_INS	Pitch_Rate_INS	Roll_Rate_INS
degrees	degrees	fps	fps	fps	ft/sec^2	ft/sec^2	ft/sec^2	degrees	degrees	deg/sec	deg/sec

Lat_INS degrees	Long_INS degrees	VN_INS fps	VE_INS fps	VV_INS fps	AN_INS ft/sec^2	AE_INS ft/sec^2	AZ_INS ft/sec^2	Pitch_INS degrees	Roll_INS degrees	Pitch_Rate_INS deg/sec	Roll_Rate_INS deg/sec
30.674038	-86.591308	-0.068	-0.282	0.504	-3.254	-2.333	37.2	0.236	-10.5	1.27	-1.03

THDG_INS	MHDG_INS	Turn_Rate_Sys	HDG_Ref_Sys	Attitude_Ref_Sys	Navigation_Mode	INS_Figure_of_merit	CDU_Screen
degrees	degrees	deg/sec				9=best	

THDG_INS degrees	MHDG_INS degrees	Turn_Rate_Sys deg/sec	HDG_Ref_Sys	Attitude_Ref_Sys	Navigation_Mode	INS_Figure_of_merit 9=best	CDU_Screen
333.4	334.3	0.0712	Magnetic	INS	Kalman-inertial	9	Present_Position

Pilot_HDD_Display Pilot_HDD_Declutter Copilot_HDD_Display Copilot_HDD_Declutter Map_Mode Map_Scale

Pilot_HDD_Display	Pilot_HDD_Declutter	Copilot_HDD_Display	Copilot_HDD_Declutter	Map_Mode	Map_Scale
Hover	Mode_A	Hover	Mode_A	Imagery	1_NM